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The authority for the indexing vocabulary used in the subject index of this issue of *STAR* is the *NASA Thesaurus*. The most recent version is the *NASA Thesaurus—Alphabetical Update* (NASA SP-7040), September 1971, which is available from NTIS as accession number N72-15923 for $6.00 in paper copy. The current cross-reference structuring for each term appears in this volume, together with additional approved terms that may be used in indexing documents announced in other issues of *STAR*. NASA SP-7040 supersedes the first two volumes (subject terms A–Z) of the three-volume *Preliminary Edition of the NASA Thesaurus* (NASA SP-7030), December 1967. Volume III of the Preliminary Edition presented the following aids to vocabulary selection of the 1967 terms: hierarchical display of index terms, category terms listing, and permuted index; this has not been updated but may still be useful.

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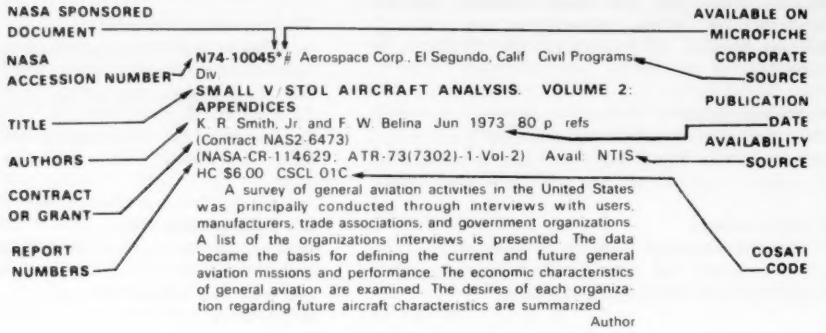
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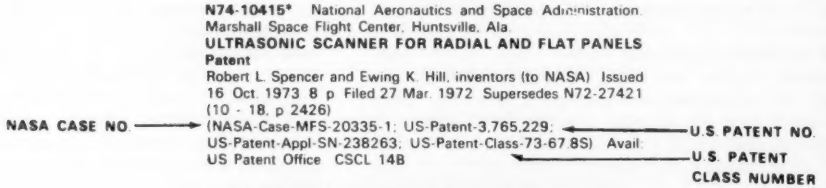
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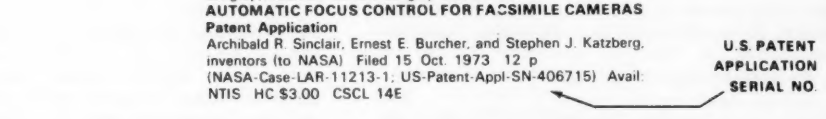
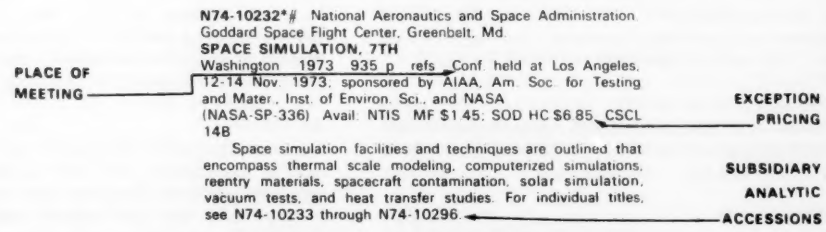
Patent
Robert L. Spencer and Ewing K. Hill, inventors (to NASA). Issued 16 Oct. 1973. 8 p. Filed 27 Mar. 1972. Supersedes N72-27421 (10 - 18, p. 2426)
NASA CASE NO.
(NASA-Case-MFS-20335-1; US-Patent-3,765,229; US-Patent-Appl-SN-238263; US-Patent-Class-73-67.8S) Avail: US Patent Office CSCL 14B
U.S. PATENT NO.
U.S. PATENT CLASS NUMBER

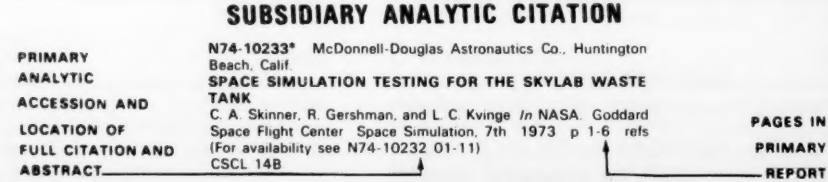
PATENT APPLICATION CITATION


N74-10420*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AUTOMATIC FOCUS CONTROL FOR FACSIMILE CAMERAS
Patent Application
Archibald R. Sinclair, Ernest E. Burcher, and Stephen J. Katzberg, inventors (to NASA). Filed 15 Oct. 1973. 12 p.
(NASA-Case-LAR-11213-1; US-Patent-Appl-SN-406715) Avail: NTIS HC $3.00 CSCL 14E
U.S. PATENT APPLICATION SERIAL NO.

PRIMARY ANALYTIC CITATION AND ABSTRACT


N74-10232*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPACE SIMULATION, 7TH
PLACE OF MEETING
Washington. 1973. 935 p. refs. Conf. held at Los Angeles, 12-14 Nov. 1973, sponsored by AIAA, Am. Soc. for Testing and Mater., Inst. of Environ. Sci., and NASA
EXCEPTION PRICING
(NASA-SP-336) Avail: NTIS MF $1.45; SOD HC $6.85 CSCL 14B
Space simulation facilities and techniques are outlined that encompass thermal scale modeling, computerized simulations, reentry materials, spacecraft contamination, solar simulation, vacuum tests, and heat transfer studies. For individual titles, see N74-10233 through N74-10296.
SUBSIDIARY ANALYTIC ACCESSIONS

SUBSIDIARY ANALYTIC CITATION


PRIMARY ANALYTIC ACCESSION AND LOCATION OF FULL CITATION AND ABSTRACT
N74-10233* McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
SPACE SIMULATION TESTING FOR THE SKYLAB WASTE TANK
C. A. Skinner, R. Gershman, and L. C. Kvinge In NASA. Goddard Space Flight Center. Space Simulation, 7th. 1973. p. 1-6. refs.
(For availability see N74-10232 01-11)
CSCL 14B
PAGES IN PRIMARY REPORT

VOLUME 12 NUMBER 7 / APRIL 8, 1974

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N74-15700 Washington Univ., Seattle.
A PREDICTION MODEL FOR WAKE RELATED SOUND GENERATION BY SINGLE AIRFOILS AND SUBSONIC ROTORS Ph.D. Thesis
Larry Trumbull Clark 1973 159 p
Avail: Univ. Microfilms Order No. 73-27642

A model for the prediction of wake related sound generation by a single airfoil is presented. The basis of the model is an assumption that the net force fluctuation on an airfoil may be expressed in terms of the net momentum fluctuation in the near wake of the airfoil. This near wake model results in the forcing function for sound generation being the spectra of the two point velocity correlations in the turbulent region near the airfoil trailing edge. The single airfoil result was extended to a rotor geometry and comparisons studied for various aerodynamic parameters. The motion of the source was found to influence the spectrum of radiated sound very little. This was due to the relatively broad band spectrum of the source. Sample computations were made for large subsonic rotors and the noise levels due to the wake mechanism alone were found to be significant.
Dissert. Abstr.

N74-15701# Pisa Univ. (Italy).
A METHOD FOR MEASURING THE DYNAMIC STABILITY CYR IN A SUBSONIC WIND TUNNEL [UN METODO PER LA MISURA DELLA DERIVATA DINAMICA DI STABILITA CYR IN GALLERIA AERODINAMICA SUBSONICA]
G. Barsotti, C. Casarosa, and G. Rossi 1972 36 p refs In ITALIAN
(Rept-1427) Avail: NTIS HC $4.00

A method is described for measuring the dynamic stability derivative by means of the free oscillations of a model in a wind tunnel. This method is based on the measurement of the existing phase between a signal proportional to the deviation of the model, and a signal proportional to the angle of rotation. The stability derivative of an aircraft model with delta wings is determined, and the results compared to those derived by other methods.
Transl. by F.O.S.

N74-15702# Weapons Research Establishment, Salisbury (Australia).
DESCRIPTION OF SIX DEGREE OF FREEDOM RIGID AIRCRAFT MATHEMATICAL MODELS
J. A. Rein, J. E. Barrett, and R. Wilson Mar. 1973 67 p refs
(WRE-TN-901(WR/D)) Avail: NTIS HC $5.50

The development of a mathematical model for investigating the flight dynamics of a high speed aircraft is discussed. The mathematical model requires a data store containing the physical parameters of the aircraft under study, the static aerodynamic force and moment coefficients as nonlinear functions of the Mach number, angle of incidence and yaw, and the aerodynamic derivatives with respect to roll, pitch, and yaw rates tabulated against Mach number and angle of incidence. Simulation of the aircraft motion is then performed by solving the six degree of freedom Euler equations of motion for a rigid body, referred to body axes through the center of mass.
Author

N74-15703*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
FIXED-BASE SIMULATION STUDY OF DECOUPLED CONTROLS DURING APPROACH AND LANDING OF A STOL TRANSPORT AIRPLANE
G. Kimball Miller, Jr., Perry L. Deal, and Robert A. Champine Washington Feb. 1974 63 p refs
(NASA-TN-D-7363; L-8825) Avail: NTIS HC $3.50 CSCL 01B

A fixed-base visual simulation study has been conducted to evaluate the use of decoupled controls as a means for reducing pilot workload during approach and landing of an externally blown jet-flap short take-off and landing (STOL) transport. All six rigid-body degrees of freedom were employed with the aerodynamic characteristics based on wind-tunnel data. The primary piloting task was to use a flight director to capture and maintain a two-segment glide slope, with a closed-circuit television display of a STOL airport used during simulations of the flare and landing. The decoupled longitudinal controls used constant prefilter and feedback gains to provide steady-state decoupling of flight-path angle, pitch angle, and forward velocity. The pilots were enthusiastic about the decoupled longitudinal controls but believed the decoupled concept offered no significant advantage over conventional controls in the lateral mode.
Author

N74-15704*# Calspan Corp., Buffalo, N.Y.
ANALYSIS OF THE FLOW ABOUT DELTA WINGS WITH LEADING EDGE SEPARATION AT SUPERSONIC SPEEDS
Joseph P. Nenni and Chee Tung [1974] 43 p refs
(Contract NAS1-11577)
(NASA-CR-132358) Avail: NTIS HC $4.25 CSCL 01A

A research program was conducted to develop an improved theoretical flow model for the flow about sharp edge delta wings with leading-edge separation at supersonic speeds. The flow model incorporates a representation of the secondary separation region which occurs just inboard of the leading edge on such wings and is based on a slender-wing theory whereby the full three-dimensional problem is reduced to a quasi two-dimensional problem in the cross-flow plane. The secondary separation region was modeled by a surface distribution of singularities or a linearized type of cavity representation. The primary vortex and separation were modeled by a concentrated vortex and cut in the cross-flow potential which represents its feeding sheet (in the sense of Brown and Michael). The formulation is made determinate by requiring that the stream lines in the cavity region be conical rays, by imposing a cavity closure condition, by applying a Kutta condition at the wing leading edge, and by requiring that the primary vortex and its feeding sheet be force free. The flow

model reduces to that of Brown and Michael in the limit of zero cavity width. Author

N74-15705# Naval Ship Research and Development Center, Bethesda, Md.
A LINEARIZED THEORY FOR THE UNSTEADY MOTIONS OF A WING IN CURVED FLIGHT
Edwin C. James Aug. 1973 29 p refs
(ZR0230101)
(AD-769671; NSRDC-4098) Avail: NTIS CSCL 20/4

A linearized theory is developed to treat small-amplitude unsteady motions of a wing in curved flight at variable local forward speeds in an inviscid incompressible fluid. The wing geometry, motions, and flight path are specified and the problem is to obtain the time-dependent force, moment, power required to sustain the motion, pressure and velocity fields, and energy loss due to the shedding of vorticity. The theory is expected to provide useful estimates provided the wing does not cross its own wake. The effect of path curvature is a particular interest in this investigation. To contrast this effect, the results can be readily compared with those for a wing in straight-line flight.
Author (GRA)

N74-15706# Naval Postgraduate School, Monterey, Calif.
A NONLINEAR RELAY MODEL FOR POST STALL OSCILLATIONS
Arthur L. Schoenstadt Sep. 1973 36 p ref
(RR0000150)
(AD-769405; NPS-53ZH73091A) Avail: NTIS CSCL 01/1

A simplified non-linear relay model is developed to describe observed post-stall oscillations in aircraft. The predictions of the model are evaluated against results obtained by numerical techniques, and shown to yield close agreement. Author (GRA)

N74-15707# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EXPERIMENTAL INVESTIGATION OF A HIGH LIFT DEVICE ON THE OWL WING M.S. Thesis
George William Anderson Mar. 1973 91 p refs
(AD-769492; GAM/AE/73-6) Avail: NTIS CSCL 01/1

A study was made of the aerodynamic function of the comblike fixtures found on the leading edge of owl wings. Microphotographs of an owl's wing showed the comb to resemble a row of spanwise twisted airfoils oriented to form a cascade. Smoke flow visualization tests on an owl wing showed that the comb acts as a cascade which turns the flow close to the wing leading edge in a spanwise direction. Flow visualization experiments were run using flat plate and cambered airfoils with combs in a low speed three-dimensional wind tunnel. Results showed that the leading edge comb produced a stationary spanwise vortex that delays flow separation at high angles of attack. The high lift device was related to the vortex lift phenomena observed on delta wing aircraft. The comb's small relative size, simple structure, and lack of moving parts may make it attractive for aircraft use.
Author (GRA)

N74-15708# Ballistic Research Labs., Aberdeen Proving Ground, Md.
CHAPMAN-KIRK REDUCTION OF FREE-FLIGHT RANGE DATA TO OBTAIN NONLINEAR AERODYNAMIC COEFFICIENTS
Robert H. Whyte, Angela Jeung, and James W. Bradley May 1973 58 p refs
(AD-762148; BRL-MR-2298) Avail: NTIS CSCL 19/4

The Chapman-Kirk technique for obtaining the parameters in a system of differential equations was applied to time, position, and orientation measurements taken along the trajectories of twelve rounds fired in the BRL Transonic Range. The twelve rounds represent four spin-stabilized projectile types: the M71, the M329A1 with and without extension and the M329A1E1. The rounds were previously reduced at BRL by standard, linear reduction techniques; the Chapman-Kirk reduction was carried out by the General Electric Company under contract to BRL. A comparison of the BRL and GE results shows good agreement in the linear coefficients. The Chapman-Kirk technique has the advantage-particularly for large yaw rounds, where linear analysis breaks down that it can determine from a single trajectory the values of the nonlinear coefficients present in the equations of motion.
Author

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N74-15709# National Aeronautical Lab., Bangalore (India).
CHANGES IN FLUTTER RESULTS BY STIFFENING SOME DEGREES OF FREEDOM
Kurze Mittelung Nov. 1973 11 p refs Transl. into ENGLISH from Z. Flugwiss. (Brunswick), v. 6, 1973 p 213-215
(TR-195) Avail: NTIS HC $3.00 CSCL 01C

A method for conducting a flutter analysis of elastically connected aircraft structures with low masses is presented. In the first step, the flutter results are changes so that the concerned parts appear to be rigidly connected to the main frame. In the second step, the degree of freedom is allowed so that the stiffness of the joint can be arbitrarily chosen. The method has the advantage that in the second step the masses associated with the degree of freedom can be introduced and ascertained through supplementary tests or through calculations. Author

N74-15710*# Hydronautics, Inc., Laurel, Md.
EVALUATION OF EFFECTIVENESS OF VARIOUS DEVICES FOR ATTENUATION OF TRAILING VORTICES BASED ON MODEL TESTS IN A LARGE TOWING BASIN Final Report
Karl L. Kirkman, Clinton E. Brown, and Alex Goodman Washington NASA Dec. 1973 114 p refs
(Contract NAS1-11389)
(NASA-CR-2202) Avail: NTIS HC $4.25 CSCL 01B

The effectiveness of various candidate aircraft-wing devices for attenuation of trailing vortices generated by large aircraft is evaluated on basis of results of experiments conducted with a 0.03-scale model of a Boeing 747 transport aircraft using a technique developed at the HYDRONAUTICS Ship Model Basin. Emphasis is on the effects produced by these devices in the far-field (up to 8 kilometers downstream of full-scale generating aircraft) where the unaltered vortex-wakes could still be hazardous to small following aircraft. The evaluation is based primarily on quantitative measurements of the respective vortex velocity distributions made by means of hot-film probe traverses in a transverse plane at selected stations downstream. The effects of these altered wakes on rolling moment induced on a small following aircraft are also studied using a modified lifting-surface theory with a synthesized Gates Learjet as a typical example. Lift and drag measurements concurrently obtained in the model tests are used to appraise the effects of each device investigated on the performance characteristics of the generating aircraft.
Author

N74-15711*# Boeing Vertol Co., Philadelphia, Pa.
V/STOL TILT ROTOR AIRCRAFT STUDY: WIND TUNNEL TESTS OF A FULL SCALE HINGELESS PROP/ROTOR DESIGNED FOR THE BOEING MODEL 222 TILT ROTOR AIRCRAFT
J. P. Magee and H. R. Alexander Oct. 1973 873 p refs
(Contract NAS2-6505)
(NASA-CR-114664; D222-10059-1) Avail: NTIS HC $45.75 CSCL 01C

The rotor system designed for the Boeing Model 222 tilt rotor aircraft is a soft-in-plane hingeless rotor design, 26 feet in diameter. This rotor has completed two test programs in the NASA Ames 40' X 80' wind tunnel. The first test was a windmilling rotor test on two dynamic wing test stands. The rotor was tested up to an advance ratio equivalence of 400 knots. The second test used the NASA powered propeller test rig and data were obtained in hover, transition and low speed cruise flight.

Test data were obtained in the areas of wing-rotor dynamics, rotor loads, stability and control, feedback controls, and performance to meet the test objectives. These data are presented. Author

N74-15712*# Boeing Commercial Airplane Co., Seattle, Wash.
DESIGN OF A POWERED ELEVATOR CONTROL SYSTEM Final Report
W. L. B. Glende 22 Jan. 1974 135 p refs
(Contract NAS2-7293)
(NASA-CR-114727) Avail: NTIS HC $8.75 CSCL 01C

The design, fabrication and flight testing of a powered elevator system for the Augmentor Wing Jet STOL Research Aircraft (AWJSRA or Mod C-8A) are discussed. The system replaces a manual spring tab elevator control system that was unsatisfactory in the STOL flight regime. Pitch control in the AWJSRA is by means of a single elevator control surface. The elevator is used for both maneuver and trim control as the stabilizer is fixed. A fully powered, irreversible flight control system powered by dual hydraulic sources was designed. The existing control columns and single mechanical cable system of the AWJSRA have been retained as has been the basic elevator surface, except that the elevator spring tab is modified into a geared balance tab. The control surface is directly actuated by a dual tandem moving body actuator. Control signals are transmitted from the elevator aft quadrant to the actuator by a linkage system that includes a limited authority series servo actuator. Author

N74-15713*# Boeing Commercial Airplane Co., Seattle, Wash.
A STUDY TO DETERMINE THE FEASIBILITY OF A LOW SONIC BOOM SUPERSONIC TRANSPORT Final Report, Nov. 1972 - Jul. 1973
Edward J. Kane Washington NASA Dec. 1973 129 p refs
(Contract NAS1-11877)
(NASA-CR-2332; D6-41177) Avail: NTIS HC $4.50 CSCL 01C

A study was made to determine the feasibility of supersonic transport configurations designed to produce a goal sonic boom signature with low overpressure. The results indicate that, in principle, such a concept represents a potentially realistic design approach assuming technology of the 1985 time period. Two sonic boom goals were selected which included: (1) A high speed design that would produce shock waves no stronger than 48 Newtons per square meter (1.0 psf); and an intermediate Mach number (mid-Mach) design that would produce shock waves no stronger than 24 Newtons per square meter. The high speed airplane design was a Mach 2.7 blended arrow wing configuration which was capable of carrying 183 passengers a distance of 7000 km (3780 nmi) while meeting the signature goal. The mid-Mach airplane designed was a Mach 1.5 low arrow wing configuration with a horizontal tail which could carry 180 passengers a distance of 5960 km (3220 nmi). Author

N74-15714*# McDonnell-Douglas Corp., Long Beach, Calif.
A STUDY TO DETERMINE THE APPLICABILITY OF NOISE ABATEMENT APPROACH PROCEDURES TO MCDONNELL DOUGLAS AIRCRAFT Final Report
John A. Painter and James H. Shannon Dec. 1973 59 p
(Contract NAS2-7586)
(NASA-CR-114677; MDC-J6220) Avail: NTIS HC $5.00 CSCL 01C

Analyses of McDonnell Douglas DC-8, DC-9, and DC-10 jet transports were conducted to investigate the applicability of two segment approach noise abatement procedures to these airplanes. All models had the required glide slope capability at the certified landing flap settings. The DC-8 models would probably be limited to an upper segment glide slope of 5.5 degrees and would probably not be suitable for the two segment procedure in icing conditions. The DC-8 would not be compatible with this procedure at a reduced landing flap setting. The feasibility of installing a two segment approach system in the Douglas-built fleet of commercial jet transports from a hardware viewpoint is discussed. The candidate system consists of a two segment computer plus the necessary peripheral equipment interfaced with the existing autopilot and associated avionics. The required modifications and additions to existing equipment are described and the attendant costs estimated. Potential problems which may be encountered are also discussed. Author

N74-15715*# Systems Technology, Inc., Hawthorne, Calif.
DESIGN OF A FLIGHT DIRECTOR/CONFIGURATION MANAGEMENT SYSTEM FOR PILOTED STOL APPROACHES
Roger H. Hoh, Richard H. Klein, and Walter A. Johnson Sep. 1973 177 p refs
(Contract NAS2-6441)
(NASA-CR-114688; STI-TR-1015-3) Avail: NTIS HC $11.00 CSCL 01C

The design and characteristics of a flight director for V/STOL aircraft are discussed. A configuration management system for piloted STOL approaches is described. The individual components of the overall system designed to reduce pilot workload to an acceptable level during curved, decelerating, and descending STOL approaches are defined. The application of the system to augmentor wing aircraft is analyzed. System performance checks and piloted evaluations were conducted on a flight simulator and the results are summarized. Author

N74-15716*# Hydrospace-Challenger, Inc., San Diego, Calif.
NOISE MEASUREMENTS OBTAINED DURING ENGINEERING EVALUATION OF TWO-SEGMENT APPROACHES IN A 727-200 AIRCRAFT
Carole S. Tanner and Ray E. Glass 21 Jan. 1974 54 p
(Contract NAS2-7369)
(NASA-CR-114691; HCI-TR-S-229) Avail: NTIS HC $4.75 CSCL 01C

A series of noise measurements were made during engineering evaluation tests of two-segment approaches in a 727-200 aircraft equipped with acoustically treated nacelles. A two-segment approach having a 6-degree upper glide slope angle intercepting the Instrument Landing System (ILS) 2.9-degree glide slope at an altitude of 690 feet gave a 5-EPNdB decrease in measured noise at distances greater than 3 nautical miles from the runway threshold when compared with a normal ILS approach. Several of the noise measurements were taken under adverse weather conditions which were outside the specified limits of FAR Part 36. This may introduce uncertainties into the data from several approaches. Author

N74-15717*# Lockheed-Georgia Co., Marietta.
C-5A/ORBITER WIND TUNNEL TESTING AND ANALYSIS: PIGGYBACK FERRY Final Report
K. H. Tomlin, W. T. Blackerby, A. C. Hughes, E. G. Husband, and J. H. Paterson Dec. 1973 239 p refs
(Contract NAS9-13702)
(NASA-CR-133484; LG73ER0193) Avail: NTIS HC $14.00 CSCL 01C

Wind tunnel testing and analytical studies of the feasibility of ferrying the NASA Shuttle Orbiter on the C-5A in a piggyback mode have been accomplished. Testing was conducted in the 8x12 foot low speed wind tunnel using an existing 0.0399 scale C-5A model in conjunction with a NASA 0.0405 scale Orbiter model. Six component force and moment data were measured over a range of pitch and yaw angles to determine lift and drag characteristics, lateral/directional stability characteristics and longitudinal and directional control powers. A description of the wind tunnel test program with a run schedule and the complete plotted data for all the test runs are presented. Initial emphasis was given to determining the effects of the Orbiter above the C-5A and the optimum location for minimum interference on C-5A characteristics. A comprehensive series of cruise configurations were tested including a range of Orbiter longitudinal and vertical locations, incidences, and afterbody fairings. Subsequently, a series of configurations were devised during the test program to determine means of recovering directional stability degradation due to Orbiter interference. Author

N74-15718*# Kanner (Leo) Associates, Redwood City, Calif.
REDUCTION OF AIRCRAFT NOISE IN THE VICINITY OF AIRPORTS
B. N. Melnikov Washington NASA Feb. 1974 39 p refs Transl. into ENGLISH of "Snizhenie Shuma Samoletov v Okrestnostiakh Aeroportov", paper presented at USSR/US Aeron. Technol. Symp., Moscow, 23-27 Jul. 1973 30 p
(Contract NASw-2481)
(NASA-TT-F-15237) Avail: NTIS HC $4.00 CSCL 01C

The main sources of noise from modern transport aircraft

are examined along with currently employed means of minimizing the influence of aircraft noise on communities neighboring air terminal areas. The complexity of the task is elucidated by stressing the importance of unified development and implementation of measures designed to reduce the noise both at the source and along its path of propagation. These measures are identified as specially designed low-noise engines, traffic control and flightmaneuver procedures stressing noise abatement, and architectural as well as urban planning guidelines in the growth of nearby communities. Operational examples of noise abatement procedures employed by current Soviet transport aircraft are described, and their effectiveness is evaluated. Author

N74-15719*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ACOUSTIC CHARACTERISTICS OF A LARGE-SCALE WIND TUNNEL MODEL OF AN UPPER-SURFACE BLOWN FLAP TRANSPORT HAVING TWO ENGINES
Michael D. Falarski, Kiyoshi Aoyagi, and David G. Koenig Sep. 1973 82 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Moffett Field, Calif.
(NASA-TM-X-62319) Avail: NTIS HC $6.25 CSCL 01C

The upper-surface blown (USB) flap as a powered-lift concept has evolved because of the potential acoustic shielding provided when turbofan engines are installed on a wing upper surface. The results from a wind tunnel investigation of a large-scale USB model powered by two JT15D-1 turbofan engines are presented. The effects of coanda flap extent and deflection, forward speed, and exhaust nozzle configuration were investigated. To determine the wing shielding the acoustics of a single engine nacelle removed from the model were also measured. Effective shielding occurred in the aft underwing quadrant. In the forward quadrant the shielding of the high frequency noise was counteracted by an increase in the lower frequency wing-exhaust interaction noise. The fuselage provided shielding of the opposite engine noise such that the difference between single and double engine operation was 1.5 PNdB under the wing. The effects of coanda flap deflection and extent, angle of attack, and forward speed were small. Forward speed reduced the perceived noise level (PNL) by reducing the wing-exhaust interaction noise. Author

N74-15720*# General Electric Co., Pittsfield, Mass.
PRELIMINARY TESTS OF VULNERABILITY OF TYPICAL AIRCRAFT ELECTRONICS TO LIGHTNING-INDUCED VOLTAGES Final Report
J. A. Plumer and L. C. Walko Washington NASA Feb. 1974 50 p refs
(Contract NAS3-14836)
(NASA-CR-2350; SRD-72-067) Avail: NTIS HC $3.00 CSCL 01C

Tests made on two pieces of typical aircraft electronics equipment to ascertain their vulnerability to simulated lightning-induced transient voltages representative of those which might occur in flight when the aircraft is struck by lightning were conducted. The test results demonstrated that such equipment can be interfered with or damaged by transient voltages as low as 21 volts peak. Greater voltages can cause failure of semiconductor components within the equipment. The results emphasize a need for establishment of coordinated system susceptibility and component vulnerability criteria to achieve lightning protection of aerospace electrical and electronic systems. Author

N74-15721# Naval Academy, Annapolis, Md.
EXTERNAL AERODYNAMICS OF SURFACE EFFECT VEHICLES
Robert E. Fishman 21 May 1973 88 p refs
(AD-769506; USNA-TSPR-42) Avail: NTIS CSCL 01/3

The speeds of surface effect vehicles are of the order of one hundred knots. At these speeds aerodynamic forces become significant necessitating an understanding of the craft external aerodynamics. In order to predict external flow phenomenon about a hovercraft a discrete vortex model was applied to the problem. This model was programmed and run on a Honeywell 635 computer. A corresponding experimental model was designed, fabricated, and tested. The results of the experimental programme and those obtained from the analytical computer study were then compared. It appears that the discrete vortex model is an effective means of representing the external aerodynamics of surface effect vehicles provided that sufficient computer space is available. Author (GRA)

N74-15722# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany).
TABLES FOR FLIGHT TESTS [TABELLENBUCH FUER DEN FLUGVERSUCH]
1973 113 p In GERMAN
Avail: NTIS HC $7.75

The tables include data on standard atmosphere, calibration velocity determination from pressure gradients, calibration Mach number, and sound velocity. ESRO

N74-15723# Battelle Columbus Labs., Ohio.
DESIGN GUIDE FOR THE USE OF STRUCTURAL SHAPES IN AIRCRAFT APPLICATIONS. PART 1: SELECTION CRITERIA FOR STRUCTURAL SHAPES AND TUBING. PART 2: MANUFACTURING METHODS FOR STRUCTURAL SHAPES AND TUBING Final Technical Report, 1 Aug. 1971 - 30 Jul. 1973
Sep. 1973 226 p refs
(Contract F33615-71-C-1929)
(AD-769042; AFML-TR-73-211-Pt-1-Pt-2) Avail: NTIS CSCL 01/3

A two-part Design Guide was compiled to provide technical information and data in the production of structural shapes and tubing for aircraft and aerospace requirements. Part I provides selection criteria for shapes and tubing based on availabilities, design tolerances, and mechanical and physical properties. Part II discusses manufacturing methods for fabricating structural shapes and tubing, namely, extrusion, drawing, and form rolling. Also Part II reviews competitive processes for manufacturing structural type components. This Design Guide is intended to assist design engineers in assessing the availability and properties of materials being considered in new or modified aircraft and aerospace systems, and to assist potential manufacturers and suppliers in assessing equipment, tooling, and processing requirements for fabricating structural shapes and tubing. Materials for aerospace requirements covered in the document include high-strength aluminum alloys, titanium alloys, steels, superalloys, refractory metals, and beryllium. Author (GRA)

N74-15724# Systems Associates, Inc., Long Beach, Calif.
US ARMY HELICOPTER ROD END BEARING RELIABILITY AND MAINTAINABILITY INVESTIGATION Final Report
Sheldon Dockswell and James L. Huffman Jun. 1973 124 p
(Contract DAAJ02-71-D-0003; DA Proj. 1F1-62205-A-119)
(AD-768843; SAI-R72-012; USAAMRDL-TR-73-35) Avail: NTIS CSCL 01/3

The investigation was carried out to identify, isolate, and verify the causes of problems with rod end bearings (REB) used on U.S. Army helicopters and to trace the resulting effects on helicopter availability. Design requirements, quality assurance provisions, maintenance procedures and practices, test requirements, and procurement practices were analyzed to assess their impact upon the current problems. Excessive play between ball and race was found to be the REB's chief failure mode. Design does not adequately contend with a vibratory environment which tends to cause widening of the race. Quality assurance was neither imposed upon the bearing vendors nor demonstrated by airframe manufacturers. A recommendation was made for a specification to be developed to govern existing or new designs, which include a stainless steel ball with a ceramic coating and a graphite race, a slotted spherical bearing, and an elastomeric spherical bearing. The recommended specification for helicopter REB's includes bond and material integrity, loading, vibration, dust, misalignment angle, qualification and conformity requirements. Specific recommendations for improvements to the policies, practices, and procedures are made in the report; hardware improvements are also discussed. Author (GRA)

N74-15725# Boeing Vertol Co., Philadelphia, Pa.
HLH GROUND SUPPORT EQUIPMENT (GSE) PRELIMINARY INVESTIGATION Final Report, Mar. - May 1973
John M. Corso, Thomas S. Hammer, and Frank J. Kozloski Jun. 1973 124 p
(Contract DAAJ02-72-C-0041; DA Proj. 1F1-62203-A-434)

(AD-768842; D301-10188-1; USAAMRDL-TR-73-52) Avail: NTIS CSCL 01/3

The preliminary study was conducted to determine the GSE required for the heavy-lift helicopter (HLH) early enough in the program to allow ample time for development/procurement of long lead time items. The HLH aircraft systems were analyzed during the preliminary design stage to establish maintenance concepts, identify the necessary organizational and direct support level tasks, and select equipment suitable for performing the tasks identified. The selected equipment was classified as existing as-is, existing requiring modification, or not available and requiring new design and development effort. The elapsed maintenance time and the number of personnel required to perform organizational and direct support level tasks in the Army aviation environment were determined. In some instances, several alternate approaches for GSE were identified which will require trade-offs to complete the equipment selection process. (Modified author abstract) GRA

N74-15726# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

ANALYSIS OF CONTROL SURFACE AUGMENTATION IN HIGH-PERFORMANCE AIRCRAFT BY THRUST VECTORING M.S. Thesis

Deas H. Warley, III Mar. 1973 111 p refs

(AD-769495; GAM/AE/73-14) Avail: NTIS CSCL 01/2

The feasibility of engine thrust vectoring for lateral control of aircraft in the high angle-of-attack regime was investigated for an airplane with F-11 characteristics. The technique was found to be effective in increasing the angle-of-attack at which departure occurs. The method used an effective dynamic directional stability parameter to account for the thrust effect alteration of the static lateral stability parameters Cn beta and Cl beta. Although the effective Cl beta sub dyn could not be used to predict departure in the model studied, it was useful in evaluating the effectiveness of the thrust vectoring concepts. Author (GRA)

N74-15727# Air Force Materials Lab., Wright-Patterson AFB, Ohio.

CONFERENCE ON TRANSPARENT AIRCRAFT ENCLOSURES

Robert E. Wittman, comp. Jun. 1973 844 p refs Conf. held at Las Vegas, Nev., 5-8 Feb. 1973

(AF Proj. 7381)

(AD-769344; AFML-TR-73-126) Avail: NTIS CSCL 01/3

The purpose of the report is to make available the technical papers presented at the recent Tenth Conference on Transparent Aircraft Enclosures. This conference was held for the exchange of knowledge on new developments and design concepts concerned with vision areas of crew enclosures. Also to make known the state-of-the-art with respect to transparent plastics, interlayer materials, and glass, of the type suitable for these applications. The papers contained have been reproduced directly from the original manuscripts. Author (GRA)

N74-15728# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.

STUDIES IN LOW SPEED FLIGHT Final Report, 1 Jun. 1971 - 31 Aug. 1973

Robin B. Gray, Howard M. McMahon, George T. Bird, and John G. Palfery Sep. 1973 14 p refs

(Grant DA-ARO-(D)-31-124-71-G177)

(AD-768858; AROD-10233-1-E) Avail: NTIS CSCL 01/3

A model helicopter hovering flight test facility is briefly described and the results of the study to date are summarized. The objective is to design, construct, and validate a facility which would closely simulate free still-air conditions in a relatively small confined space. Tests in a one-quarter scale prototype using model airplane propellers successfully demonstrated the basic concept. Results obtained in the larger facility are encouraging and the tests will continue. Author (GRA)

N74-15729# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

TWO DIMENSIONAL AIR CUSHION LANDING SYSTEM PERIPHERAL JET CONFIGURATION STUDY M.S. Thesis

John Robert Rogers Mar. 1973 102 p refs

(AD-769494; GAM/AE/73-13) Avail: NTIS CSCL 01/3

A simplified two-dimensional peripheral jet theory for the equilibrium performance of an air cushion vehicle is investigated. The proposed theory intends to yield a rapid prediction of the actual flow rate and actual power requirements for an air cushion landing system in the hover condition. Nine specific nozzle configurations were tested to determine which resulted in the best power-height performance and whether the theory is able to predict the experimental performance. Three single peripheral jet configurations were tested at a trunk pressure of 80 psfg. Six distributed jet configurations were tested at a trunk pressure of 40 psfg. Effects of inward flow injection angles of 30 degrees and 60 degrees were investigated. (Modified author abstract) GRA

N74-15730# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

AN INVESTIGATION OF COST FACTORS RELATING TO CLASS 4 AIRCRAFT MODIFICATIONS M.S. Thesis

Elvis M. Baker, William H. Burgess, and Albert F. Malkiewicz Aug. 1973 139 p refs

(AD-769195; SLSR-18-73B) Avail: NTIS CSCL 15/5

The emphasis on economic use of resources, and the necessity to justify and account for each dollar spent, has required more research into ways and means of collecting costs of public programs. Aircraft modifications have been the subject of increasing concern, and the Air Force has been criticized for not being able to identify all costs of an aircraft modification. The research is an effort to determine what significant costs are involved in Class 4 aircraft modifications, and which of these have been included in modification approval procedures. Present modification processing procedures habe been presented to enable an understanding of how costs have been collected. GRA

N74-15731# Army Electronics Command, Fort Monmouth, N.J.

TEST AND EVALUATION OF NATURAL RUBBER SPHERICAL BALLOONS

Moses Sharenow Oct. 1973 19 p refs

(DA Proj. 1T0-61102-B-53A)

(AD-769740; ECOM-5516) Avail: NTIS CSCL 01/3

The report covers the test and evaluation of intermediate altitude (19-21 km), fast-rising, meteorological spherical natural balloons. A quantity of 85 balloons was procured to determine their possible suitability for use by artillery units as an economical sounding vehicle to be used in conjunction with Meteorological Balloon ML-566/UM (30 km fast-rise balloon) currently under development, and as a possible replacement for Meteorological Balloon ML-541/UM, the standard 75,000 feet (23 km) fast-rise balloon now in use. The balloons were flight-tested in temperate, tropical, and arctic regions during both daytime and nighttime conditions. It is concluded that these balloons would be a valuable adjunct to the Fast-Rise Balloon System, and would be substantially more economical for use by artillery in flights to 21 km. (Modified author abstract) GRA

N74-15732# Battelle Columbus Labs., Ohio.

BALLOON TECHNOLOGY DATA BASE. VOLUME 1: REPORT EXTRACTS

E. E. Westbrook, J. E. Mortland, and E. N. Wyler Oct. 1973 320 p refs Sponsored in part by DARPA

(AD-769284) Avail: NTIS CSCL 01/3

The report is made up of extracts representing documents held in the Balloon Technology Data Base. It is presented in two separately bound volumes: Volume I - Report Extracts and Volume II - Index. The extracts in Volume I are arranged in no particular order other than serially by accession number (B-XXX followed by a letter indicating the classification of the source document). Readers with inquiries regarding a specific document should be certain to cite the accession number in order to clearly identify the document. Where several parts make up a whole as in the proceedings of a symposium, the overall proceedings have been assigned an accession number and the Table of Contents is included in the extract. However, selected papers of particular interest have also been extracted and assigned a decimal number - B-XXX.X. Each extract has been indexed by authors and appropriate terms. Although no Thesaurus has been developed, an effort has been made to maintain consistency in

the use of terms. The citations accompanying each term are complete; it was thought that this would give the searcher more information upon which to base his decisions than would a simple accession number or title. GRA

N74-15733# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
THE IMPACT OF CONVERSION TO THE METRIC MEASUREMENT SYSTEM ON AIRCRAFT MAINTENANCE AT BASE LEVEL M.S. Thesis
Robert G. Dewey and Wayne A. Mann Aug. 1973 90 p refs
(AD-769186; SLSR-5-73B) Avail: NTIS CSCL 01/3

The conclusions drawn in the thesis indicate that the impact of metric conversion on aircraft maintenance hardware will allow continued use of current shop machinery and servicing equipment with minor modification required in but few cases. The intermix of tools and stock of both dimensions can be accomplished with little difficulty by the user and will require additional storage space throughout the conversion period and for many years thereafter. Technical information will be affected but can assimilate metric in an orderly fashion. GRA

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N74-15734*# Kanner (Leo) Associates, Redwood City, Calif.
WIND ENERGY: ITS VALUE AND THE CHOICE OF SITE FOR EXPLOITATION
P. Ailleret Washington NASA Jan. 1974 20 p Transl. into ENGLISH from Rev. Gen. Elec. (Paris), v. 55, Mar. 1946 p 103-108
(Contract NASw-2481)
(NASA-TT-F-15311) Avail: NTIS HC $3.00 CSCL 10A

The problem of wind power utilization is discussed, including determination of wind power per square meter obtained yearly from surfaces subjected to wind action, and systematic prospecting for favorable sites using a simple anemometric device which calculates wind speed with the aid of a special electric meter. A description is given of a program for site selection which will make it possible to determine the energy which can be produced by the wind engines used. Author

N74-15735*# Kanner (Leo) Associates, Redwood City, Calif.
PRACTICAL EXPERIENCE WITH A DIGITAL ELECTRO-HYDRAULIC ACTUATOR
J. Tersteegen Washington NASA Feb. 1974 39 p Transl. into ENGLISH of "Praktische Erfahrungen mit einem digitalen elektro-hydraulischen Stellantrieb", West Germany report DFVLR-IB-153-73/26, 1973 40 p
(Contract NASw-2481)
(NASA-TT-F-15292; DFVLR-IB-153-73/26) Avail: NTIS HC $4.00 CSCL 01C

The basic feasibility of a digital electrohydraulic actuator has been demonstrated with the construction of a prototype. Implementation of this project required the development of electrohydraulic 3/2-way valves of high reliability and extremely short operating times. Satisfactory dynamic behavior on the part of the digital actuator is primarily determined by the accuracy of binary throughflow weighting. Detrimental movement (excess movement or movement in the wrong direction) due to inaccurate through-flow weighting or under loads should be avoidable if the output piston is locked until opposed low-level piston movements have been completed. The high-frequency detrimental movement of the digital actuator is filtered out when it is used as an anticipatory control instrument for a power amplifier to which it is connected. Author

N74-15736*# Kanner (Leo) Associates, Redwood City, Calif.
THE DYNAMIC BEHAVIOR OF A DIGITAL ELECTROHYDRAULIC ACTUATOR
C. Brinckmann Washington NASA Feb. 1974 52 p refs Transl. into ENGLISH of "Zum dynamischen Verhalten eines digitalen elektro-hydraulischen Stellantriebs", West German report DLR-FR-73-106, 1973 53 p
(Contract NASw-2481)
(NASA-TT-F-15295; DLR-FB-73-106) Avail: NTIS HC $4.75 CSCL 01C

An analysis of the dynamic behavior of the digital electrohydraulic actuator (DEHA) is presented, which indicates that an appropriate locking mechanism may allow it to be used under dynamic and static loads. The increase in load capacity is accompanied by an increase in its irregularity of motion, which means increased dynamic loads on the elements attached to it. Cycle time is affected to a limited degree by loads, but inertial load capacity is seriously limited by the magnitude of permissible overshoot; this restriction rules out the use of the DEHA for operating aircraft control surfaces directly. Its use as an anticipatory control unit in a sequential control system is suggested. A locking mechanism helps reduce the danger presented by the inaccurate calibration of throttle orifices, which may become worse over prolonged periods of operation. Author

N74-15737*# AiResearch Mfg. Co., Torrance, Calif.
DESIGN OF H2-O2 SPACE SHUTTLE APU. VOLUME 1: APU DESIGN
E. Harris Jan. 1974 278 p refs
(Contract NAS3-15708)
(NASA-CR-121214; AiResearch-74-9874-1) Avail: NTIS HC $16.00 CSCL 10A

The H2-O2 space shuttle auxiliary power unit (APU) program is a NASA-Lewis effort aimed at hardware demonstration of the technology required for potential use on the space shuttle. It has been shown that a hydrogen-oxygen power unit (APU) system is an attractive alternate to the space shuttle baseline hydrazine APU system for minimum weight. It has the capability for meeting many of the heat sink requirements for the space shuttle vehicle, thereby reducing the amount of expendable evaporants required for cooling in the baseline APU. Volume 1 of this report covers preliminary design and analysis of the current reference system and detail design of the test version of this reference system. Combustor test results are also included. Volume 2 contains the results of the analysis of an initial version of the reference system and the computer printouts of system performance. The APU consists of subsystems for propellant feed and conditioning, turbopower, and control. Propellant feed and conditioning contains all heat exchangers, valves, and the combustor. The turbopower subsystem contains a two-stage partial-admission pressure-modulated, 400-hp, 63,000-rpm turbine, a 0-to 4-g lubrication system, and a gearbox with output pads for two hydraulic pumps and an alternator (alternator not included on test unit). The electronic control functions include regulation of speed and system temperatures; and start-and-stop sequences, overspeed (rpm) and temperature limits, failsafe provisions, and automatic shutdown provisions. Author

N74-15738*# AiResearch Mfg. Co., Torrance, Calif.
DESIGN OF H2-O2 SPACE SHUTTLE APU. VOLUME 2: APPENDIXES
E. Harris Jan. 1974 225 p ref
(Contract NAS3-15708)
(NASA-CR-134485; AiResearch-74-9874-2) Avail: NTIS HC $13.25 CSCL 10A

For abstract, see N74-15737.

N74-15739*# Scientific Translation Service, Santa Barbara, Calif.
HIGH POWERED ELECTRICAL POWER GENERATION BY WIND MOTORS
M. Kloss Washington NASA Feb. 1974 11 p ref Transl. into ENGLISH from Elektrotech. Z. (West Berlin), v. 72, no. 7, 1 Apr. 1951 p 201-202
(Contract NASw-2483)
(NASA-TT-F-15303) Avail: NTIS HC $3.00 CSCL 10A

The development of a wind wheel for electric power generation is discussed. The interaction between the wind wheel and the generator is accomplished with a power control device to prevent overloading the generator when the wind velocity increases. The self-controlled running wheel of the wind motor adjusts the blade angle of attack to compensate for the wind velocity. The generator

must be dimensioned for the greatest wind intensity in order to accept the entire wind wheel power. The wind generation installation delivers all of the produced energy to the network so that other generating stations operating in parallel and the storage units must adjust the power level to the consumers.
Author

N74-15740*# Techtran Corp., Glen Burnie, Md.
NEUWERK WINDMILL POWER GENERATION PLANT
W. Mackenthun Washington NASA Jan. 1974 12 p refs Transl. into ENGLISH from Elektrizitaetswirtschaft (Frankfurt am Main), no. 11, Nov. 1951 p 322-325
(Contract NASw-2485)
(NASA-TT-F-15306) Avail: NTIS HC $3.00 CSCL 10A

The installation and characteristics of a windmill power generation plant are discussed. The meteorological parameters of the German North Sea Coast which influenced the location of the windmill power generating system are analyzed. The regulating devices for compensating for changes in wind velocity are described. Results of the power generation operation for the year 1950 are tabulated.
Author

N74-15741*# Scientific Translation Service, Santa Barbara, Calif.
ECONOMY AND PRACTICAL APPLICATIONS OF LARGE WIND-DRIVEN POWER PLANTS, PART 1
H. Witte Washington NASA Feb. 1974 14 p refs Transl. into ENGLISH from Elektrotech. Z. (Berlin), v. 59, no. 51, 22 Dec. 1938 p 1373-1376
(Contract NASw-2483)
(NASA-TT-F-15308) Avail: NTIS HC $3.00 CSCL 10A

The question of the economy of large scale wind electrical generating stations is investigated based on present findings. By exploiting wind energy for producing electrical power, large amounts of coal could be made available for other uses, and would also ease our foreign currency situation. The practical aspects of large scale wind electrical power generating plants are discussed. The construction of a ring generator is described.
Author

N74-15742*# Kanner (Leo) Associates, Redwood City, Calif.
WIND-POWERED MACHINES
Ya. I. Shefter Washington NASA Jan. 1974 279 p refs Transl. into ENGLISH of the book "Vetroenergeticheskiye Agregaty" Moscow, Mashinostroyeniye Press, 1972 288 p
(Contract NASw-2481)
(NASA-TT-F-15149) Avail: NTIS HC $16.00 CSCL 10A

The basic problems connected with the selection of layouts and calculation of parameters of wind machines, their energy-producing characteristics and technical and economic indices are presented. Methods of optimal matching of wind engines with working machines, calculators for strength, and construction and automation of wind machines are analyzed in detail. A description is given of the setup of domestic and foreign wind installations for various purposes. Basic characteristics of wind as a source of energy, brief information from aerodynamics, the theory of the wind engine and calculation of its aerodynamic characteristics are presented. In conclusion, recommendations are presented for use of wind machines according to zone. The book is intended for engineers, designers and workers of scientific and research institutes connected with creation and utilization of wind machines and for engineers and mechanics in agriculture.
Author

N74-15743*# Kanner (Leo) Associates, Redwood City, Calif.
WIND POWER PLANTS IN RUSSIA
Th. Sauer Washington NASA Feb. 1974 7 p refs Transl. into ENGLISH from VDI (Ver. Deut. Ing.) Z. (West Germany), v. 81, no. 32, 7 Aug. 1937 p 947-948
(Contract NASw-2481)
(NASA-TT-F-15331) Avail: NTIS HC $3.00 CSCL 10B

Several measures relative to wind power plants have been taken by the Soviet government, and are outlined. The large Balaklava wind power plant is described briefly. The wind power experimental facility in Moscow is illustrated in a diagram and its operation discussed in some detail.
Author

N74-15744*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROCEDURE FOR ANALYSIS OF NICKEL-CADMIUM CELL MATERIALS
Gerald Halpert, Olamide Ogunyankin, and Clenton Jones Oct. 1973 46 p refs Prepared in cooperation with Federal City Coll.
(Grant NGR-09-050-003)
(NASA-TM-X-70575; X-761-73-314) Avail: NTIS HC $4.50 CSCL 10C

Quality control procedures include analyses on electrolyte, active materials, and separators for nickel cadmium cell materials. Tests range from the visual/mechanical inspection of cells to gas sampling, electrolyte extract, electrochemical tests, and physical measurements.
G.G.

N74-15745*# Kanner (Leo) Associates, Redwood City, Calif.
OBSERVATIONS ON MODERN WIND-ELECTRIC POWER PLANTS
G. Serragli Washington NASA Feb. 1974 22 p refs Transl. into ENGLISH from Elettrotecnica (Italy), v. 34, 10-25 Dec. 1947 p 494-498
(Contract NASw-2481)
(NASA-TT-F-15357) Avail: NTIS HC $3.25 CSCL 10B

Development of the aeronautical type windmill design and the installation of wind-powered electricity plants is held feasible for Italy undergoing post-war reconstruction. It is shown to be possible to build from 200 to 300 small capacity power plants for a total output of 10,000 to 15,000 kW in areas of Italy which have the minimum necessary wind speed of 5.5 m/sec. Among the designs required for such wind electricity plants are windmill blades with variable pitch, automatic pitch control system which does not use the costly servomotor, and reversible wheels. These features enable a windmill of limited orientability to function with high efficiency. The effect of wind rose patterns, the surface area of the blade, and some possible local uses of the electricity produced by such plants are also discussed.
Author

N74-15746*# Scientific Translation Service, Santa Barbara, Calif.
IMPORTANCE AND PROGRESS OF WIND POWER UTILIZATION IN DENMARK
Dimitry Stein Washington NASA Feb. 1974 11 p refs Transl. into ENGLISH from Elektrizitaetswirtschaft (Frankfurt am Main), v. 41, no. 17, 5 Sep. 1942 p 390-392
(Contract NASw-2483)
(NASA-TT-F-15353) Avail: NTIS HC $3.00 CSCL 10B

Experience derived in operating wind power systems in Denmark is described. A study is made of the efficiency of the Danish power plants.
Author

N74-15747*# Scientific Translation Service, Santa Barbara, Calif.
CHARACTERISTIC LINES (YEARLY PERMANENT LEVEL LINES) AND CHARACTERISTIC WIND VARIABLES FOR WIND ENERGY PRODUCTION
H. Pigge Washington NASA Feb. 1974 25 p refs Transl. into ENGLISH from Elektrizitaetswirtschaft (Frankfurt am Main), v. 54, no. 20, Oct. 1955 p 704-709
(Contract NASw-2483)
(NASA-TT-F-15354) Avail: NTIS HC $3.25 CSCL 10B

Optimum design methods for wind driven electrical generating plants are presented, based on yearly permanent wind level lines for selected erection sites. Wind conditions at any site are divided into five classes, of which only a few can be exploited by a given system. General purpose design curves are given.
Author

N74-15748*# Linguistic Systems, Inc., Cambridge, Mass.
METHOD OF CALCULATION OF ANNUAL OVERALL EFFICIENCY OF MODERN WIND-POWER PLANTS
F. D. Pigeaud Washington NASA Feb. 1974 13 p refs Transl. into ENGLISH from Ingenieur (The Hague), v. 63, no. 47, 23 Nov. 1971 p W137-W140
(Contract NASw-2482)
(NASA-TT-F-15310) Avail: NTIS HC $3.00 CSCL 10B

A method of calculating the annual overall efficiency of modern wind power plants equipped with asynchronous generators is

reported that takes into account the annual velocity duration curve at Den Helder, Holland. A comparison is made between variable pitch windmotor and fixed blade windmotor equipped with movable flaps. A careful calculation is recommended in view of rather small differences in efficiency for both systems. Author

N74-15749*# Kanner (Leo) Associates, Redwood City, Calif.
PROBLEMS IN THE ELECTRICAL EQUIPMENT OF WIND POWER PLANTS
M. Kloss Washington NASA Feb. 1974 42 p refs Transl. into ENGLISH from Technik (Berlin), v. 2, Nov. 1947 p 471-479
(Contract NASw-2481)
(NASA-TT-F-15312) Avail: NTIS HC $4.25 CSCL 10B

Problems encountered in electric installations of wind power plants are discussed. Difficulties involved necessitate close cooperation of aerodynamic and electrical engineer in implementing wind power plants for d-c and a-c currents. Examples of actual installations in Germany are presented; a present task is erection of small wind power plants for farms. Author

N74-15750*# Scientific Translation Service, Santa Barbara, Calif.
THE LARGE SCALE WIND DRIVEN ELECTRICAL GENERATING STATION
H. Mayer Washington NASA Feb. 1974 10 p refs Transl. into ENGLISH from Technik (Berlin), v. 2, no. 12, Dec. 1947 p 527-528
(Contract NASw-2483)
(NASA-TT-F-15313) Avail: NTIS HC $3.00 CSCL 10B

Large wind power plants and their use to alleviate coal shortage in Germany are discussed. It is stipulated that there is no economic necessity for development of large scale wind power plants before possible improvements in steam power plants, such as combined heating and power plants, high pressure plants, etc. have been exhausted. A table gives comparison of costs and efficiency of wind and steam power plants. Author

N74-15751*# Scientific Translation Service, Santa Barbara, Calif.
UTILIZATION OF WIND POWER WITH WARD-LEONARD TYPE CIRCUIT IN INVERTED OPERATION
A. Carrer Washington NASA Feb. 1974 13 p Transl. into ENGLISH from Elettrotecnica (Italy), v. 36, 10-25 Aug. 1949 p 383-385
(Contract NASw-2483)
(NASA-TT-F-15352) Avail: NTIS HC $3.00 CSCL 10B

An electric circuit is described comprising two direct current machines and one three-phase synchronous or an asynchronous induction machine suitable for transforming and feeding the energy from the wind into a three-phase conventional electric power network. Author

N74-15752*# Kanner (Leo) Associates, Redwood City, Calif.
UTILIZATION OF WIND POWER IN AGRICULTURE IN THE USSR
D. Stein Washington NASA Feb. 1974 13 p refs Transl. into ENGLISH from Elektrizitaetswirtschaft (West Germany), v. 40, no. 4, 5 Feb. 1941 p 54-56
(Contract NASw-2481)
(NASA-TT-F-15345) Avail: NTIS HC $3.00 CSCL 10B

Wind motors are being used in Russian agriculture for milling and pumping water. Plans call for rapid expansion of the utilization of such power plants. The extent of present utilization, problems, and forecasts are outlined. Author

N74-15753*# Kanner (Leo) Associates, Redwood City, Calif.
PROGRESS IN THE UTILIZATION OF WIND POWER
G. W. Meyer Washington NASA Feb. 1974 14 p refs Transl. into ENGLISH from Elektrizitaetsverwertung (Switzerland), v. 16, no. 6/7, Sep.-Oct. 1941/42 p 109-113
(Contract NASw-2481)
(NASA-TT-F-15346) Avail: NTIS HC $3.00 CSCL 10B

Wind power continues to be of interest as a source of energy for isolated locations. In order to distribute the capital costs over many service hours, the wind motors should be able to exploit low wind speeds. Low speed wind motors can be used only for driving slow machinery. High speed wind motors to drive small dynamos are now available which are self starting at low wind speeds. Large scale wind power stations have not yet passed the experimental stage. Author

N74-15754*# Scientific Translation Service, Santa Barbara, Calif.
IMPORTANCE AND PROGRESS OF WIND POWER UTILIZATION IN DENMARK
Dimitry Stein Washington NASA Feb. 1974 19 p Transl. into ENGLISH from Elektrizitaetswirtschaft (Frankfurt am Main), v. 41, no. 16, 20 Aug. 1942 p 370-374
(Contract NASw-2483)
(NASA-TT-F-15349) Avail: NTIS HC $3.00 CSCL 10B

The designs of various wind power plants in Denmark are discussed. Price lists for the plants are given along with prices for direct current generators for wind power plants. Author

N74-15755*# Kanner (Leo) Associates, Redwood City, Calif.
MEDIUM-CAPACITY AIR MOTOR PILOT PLANT WITH HYDRAULIC ENERGY ACCUMULATION BY PUMPING
Renzo Vezzani Washington NASA Feb. 1974 72 p refs Transl. into ENGLISH from Elettrotecnica (Italy), v. 37, 15-25 Sep. 1950 p 398-419
(Contract NASw-2481)
(NASA-TT-F-15299) Avail: NTIS HC $5.75 CSCL 10B

An air motor power plant is to be erected on the island of Giglio, Italy. Slow speed orientable windmill designs are replaced by high speed air motors, protected and fixed in space. The entire air motor is placed in a tubular system similar to a Venturi tube. The operation of the enclosed air motor may be regarded as similar to that of a Kaplan turbine. Author

N74-15756*# Techtran Corp., Glen Burnie, Md.
UTILIZATION OF WIND POWER
J. W. VanHeys Washington NASA Feb. 1974 11 p refs Transl. into ENGLISH from Elektrotech. Z. (Berlin), v. 64, no. 34, 22 Aug. 1940 p 787-790
(Contract NASw-2485)
(NASA-TT-F-15300) Avail: NTIS HC $3.00 CSCL 10B

The possible power of wind in a wind turbine is determined. From available wind measurements the wind frequency line is plotted to provide the basis for the design of a wind turbine. Favorable results are not obtained if work is continued on the previous principle of mill construction. There are only two ways of achieving adequate power: enlarging the circumference described by the vane and utilizing higher wind velocities. The latter are present at an altitude of about 200 meters above the ground. Satisfactory performance is attained with a vane length of 60 meters. Thus it is recommended that tests running at least one year be instituted with these dimensions. Author

N74-15757*# Scientific Translation Service, Santa Barbara, Calif.
THE DIRECT DRIVING OF SYNCHRONOUS GENERATORS BY LARGE SCALE WIND ELECTRICAL POWER GENERATING PLANTS IN PARALLEL OPERATION WITH A SYNCHRONIZING NETWORK, PART 1
Max Kloss Washington NASA Feb. 1974 27 p ref Transl. into ENGLISH from Elektrotech. Z. (West Germany), v. 63, 13 Aug. 1942 p 362-367
(Contract NASw-2483)
(NASA-TT-F-15301) Avail: NTIS HC $3.50 CSCL 10B

The damped eigen oscillation of a synchronous generator connected with a fixed network is investigated. It is assumed that the generator is driven by a wind propeller wheel. The influence of the variation of the characteristic of the propeller wheel on the variation of the transient oscillatory behavior is investigated. First the wind velocity increase occurs suddenly and then in a continuous fashion. The power control measures including propeller pitch displacement are investigated for preventing overloads on the generator. The danger of resonance is pointed out. This depends on the number of propellers. The question is discussed of whether it is better to use an asynchronous generator instead of a synchronous generator. Author

N74-15758*# Kanner (Leo) Associates, Redwood City, Calif.
THE IMPORTANCE OF AND PROGRESS IN THE UTILIZA-

TION OF WIND POWER IN DENMARK
Dimitry Stein Washington NASA Feb. 1974 17 p refs Transl. into ENGLISH from Elektrizitaetswirtschaft (Germany), v. 41, no. 15, 5 Aug. 1942 p 346-349
(Contract NASw-2481)
(NASA-TT-F-15333) Avail: NTIS HC $3.00 CSCL 10B

Denmark was one of the first countries to turn its attention to generating electric energy from wind power, because it has to import all oil and coal it uses, and it has virtually no hydroelectric power. A large number of wind power stations were built in the early years of World War I when fuel was scarce. The total production of wind power was estimated at approximately 1.8 million kWh in 1941. The installation of wind power stations was generally considered to be a temporary measure. Author

N74-15759*# Kanner (Leo) Associates, Redwood City, Calif.
APPLICATION OF WIND POWER TO RATIONAL GENERATION OF ELECTRICITY
J. Juuls Washington NASA Feb. 1974 28 p refs Transl. into ENGLISH from Elektroteknikeren (Denmark), v. 43, 7 Aug. 1947 p 137-148
(Contract NASw-2481)
(NASA-TT-F-15334) Avail: NTIS HC $3.50 CSCL 10B

The history and development of windmills in Denmark and elsewhere is sketched. The costs and problems of generating electricity by steam, water and wind power are compared. Pointing out that the wind is Denmark's only major natural source of power and dividing the application of wind power into an economic and a technological part, it is discussed how the Danish wind could be harnessed to supply power not only in the requisite amounts and at the lowest cost, but also under all circumstances, so as to make Denmark self-sufficient in the matter of energy. Author

N74-15760*# Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF THE POSSIBILITIES OF USING WIND POWER
C. Kromann and J. Juul Washington NASA Feb. 1974 11 p Transl. into ENGLISH from Elektroteknikeren (Denmark), v. 45, 7 Dec. 1949 p 711-714
(Contract NASw-2481)
(NASA-TT-F-15336) Avail: NTIS HC $3.00 CSCL 10B

Kromann's critique of several of Juul's articles in Elektroteknikeren and of Jull's riposte is reported. For example, Kromann argues that it should not be expected that wind tunnel experiments, necessary as these are for finding the best vane design, will yield the same results as real conditions; Juul counters that the same efficiency can be obtained in the open air as in a wind tunnel and that, in any case, this point will be investigated in greater detail in the near future. Kromann has misgivings about building windmills on the west coast of Jylland because he fears that the force of the wind there is too variable; Juul counters that wind force measurements show that this fear is unfounded (the corresponding curves are given). Author

N74-15761*# Kanner (Leo) Associates, Redwood City, Calif.
AIR POWER PLANTS IN RUSSIA AND THE UNITED STATES (FROM DIMITRY STEIN, ELEKTRIZITAETSWIRTSCH., VOLUME 40, NO. 16, 1941)
Washington NASA Feb. 1974 5 p Transl. into ENGLISH from Bull. Assoc. Suiss Electriciens (Zurich), v.33, no. 1, 1942 p 17-18
(Contract NASw-2481)
(NASA-TT-F-15338) Avail: NTIS HC $3.00 CSCL 10A

Various types of wind power plants in the USSR and in the USA are discussed. The VIME D-12 in Crimea, a large power plant, is described. Uses mentioned for the USA are running farm machinery, protecting pipes from corrosion due to leakage currents, and supplying power to amplifiers for telephone wires. Author

N74-15762*# Scientific Translation Service, Santa Barbara, Calif.
PARALLEL OPERATION OF A SYNCHRONOUS GENERATOR AND AN INFINITELY HIGH-POWERED NETWORK WHEN DRIVEN BY A HONNEF-GROSS WIND TURBINE
Ludwig Linner Washington NASA Feb. 1974 14 p refs Transl. into ENGLISH from Elektrotech. Z. (West Berlin), v. 69, no. 9, Sep. 1948 p 293-296
(Contract NASw-2483)
(NASA-TT-F-15302) Avail: NTIS HC $3.00 CSCL 10B

An infinite high powered network is described as a network whose voltage is independent of the load states of the connected machines, and whose voltage amplitude and angular velocity is always the same. The three-phase generator operating in conjunction with this network must operate at a constant rotation rate, as must the wind wheel according to the number of its poles and the frequency of the network. The variation in the power output of a wind wheel is discussed for constant rotation rate as a function of wind velocity in order to evaluate the operational characteristics of a synchronous machine. Author

N74-15763*# Scientific Translation Service, Santa Barbara, Calif.
ANTENNA TOWERS AS WIND TOWER GENERATION PLANTS
H. Pigge Washington NASA Feb. 1974 10 p refs Transl. into ENGLISH from Elektrotech. Z. (West Berlin), v. 73, no. 4, 15 Feb. 1952 p 95-96
(Contract NASw-2483)
(NASA-TT-F-15304) Avail: NTIS HC $3.00 CSCL 10B

A variety of wind power generating plants are considered to be installed on FM antenna masts. These include: Savonius rotor, horizontal axis wind wheels, multi-rotor configurations. Power levels vary between 10-20 kW for 100 meter mast heights. Author

N74-15764*# Kanner (Leo) Associates, Redwood City, Calif.
WIND ENERGY
G. Lacroix Washington NASA Feb. 1974 28 p refs Transl. into ENGLISH from Tech. Mod. (Paris), v. 41, nos. 5 and 6, 1 and 15 Mar. 1949 p 77-83
(Contract NASw-2481)
(NASA-TT-F-15342) Avail: NTIS HC $3.50 CSCL 10B

The technical and economic problems involved in the use of wind engines as a source of power are discussed, with detailed descriptions of the operative principles behind several basic types. Author

N74-15765*# Kanner (Leo) Associates, Redwood City, Calif.
USING LARGE WIND POWER PLANTS TO DIRECTLY DRIVE SYNCHRONOUS GENERATORS IN PARALLEL OPERATION WITH A GOVERNING NETWORK
Max Kloss Washington NASA Feb. 1974 19 p Transl. into ENGLISH from Elektrotechn. Z. (West Germany), v. 63, 27 Aug. 1942 p 388-392
(Contract NASw-2481)
(NASA-TT-F-15343) Avail: NTIS HC $3.00 CSCL 10B

Various aspects of wind powered synchronous generators are described. The influence of the fan wheel characteristic on damping of transients is slight. Altering vane position is the only feasible method for regulating power in order to avoid overloading the generator. In designing the fan wheel, and choosing the number of vanes, the operating behavior of the generator and the danger of resonance must be considered ahead of efficiency. Practical operating characteristics of the fan wheel must be known to the electrical engineer if he is to calculate the course of events during a transient. Author

N74-15766*# Kanner (Leo) Associates, Redwood City, Calif.
PROSPECTS FOR THE UTILIZATION OF WIND ENERGY IN CZECHOSLOVAKIA
F. Sembera Washington NASA Feb. 1974 25 p Transl. into ENGLISH from Elektrotechnicky Obzor (Czechoslovakia), v. 38, Sep. 1949 p 477-484
(Contract NASw-2481)
(NASA-TT-F-15305) Avail: NTIS HC $3.25 CSCL 10B

Technical and economical conditions for the utilization of airstreams in Czechoslovakia are considered. The probable mean wind velocities in various districts of the country, their number and the probable daily and yearly charts at various altitudes, the most windy districts, the possibilities and extent of utilizing the airstreams by power stations equipped with prime movers with a 50 m propeller diameter and a 30-35 m high tower are investigated and presented on the basis of many years of observation. It is determined that the power stations in

Czechoslovakia should have a maximum output of 500 kW and a yearly production of about 700,000 to 800,000 kWh, so that 1000 such stations could replace the power plant in Ervenice. The probable cost per kWh generated in the wind power plant is calculated on the basis of the proposed estimate for the capital investment and economical results are evaluated based on this solution, which are not practical in the near future. Author

N74-15767*# Kanner (Leo) Associates, Redwood City, Calif.
NEW WIND POWER STATION
E. Rogge and D. Stein Washington NASA Feb. 1974 21 p refs Transl. into ENGLISH from Elektrizitaetswirtschaft (West Germany), v. 42, no. 14, 5 Nov. 1943 p 358-363
(Contract NASw-2481)
(NASA-TT-F-15332) Avail: NTIS HC $3.25 CSCL 10B

A wind power plant is described which was used during the fuel shortage that occurred in World War 2. Unlike ordinary wind power plants which produced usable power only at wind velocities above 4 or 5 m/s, this power plant was designed to operate over a wide range, charging its battery at low wind speeds, delivering usable power from generator and discharging battery at intermediate speeds, and delivering power and charging its batteries at high wind speeds. The result was exploitation of the wind for a larger number of hours per year and lower costs per kWh of output. Author

N74-15768*# Kanner (Leo) Associates, Redwood City, Calif.
WIND-POWER SUPPLY FOR THE DECIMETER RANGE DIRECTIONAL RADIO SITE AT SCHOENEBERG (EIFEL) AND THE EXPERIENCE GAINED
G. Rosseler Washington NASA Feb. 1974 29 p refs Transl. into ENGLISH from Nachrichtentech. Z. (West Germany), v. 12, Jul. 1959 p 352-360
(Contract NASw-2481)
(NASA-TT-F-15337) Avail: NTIS HC $3.50 CSCL 10B

The Schoeneberg directional radio station is located far from public power lines on a hilltop where the average wind velocity is 5.6 m/sec. The station, as first designed, required 26 kWh/day of dc power. It uses two Allgaier wind power systems, Dr. Hutter type WE/G 6, with a nominal output of 6 kW at 9 m/sec and 1 kW at 4.2 m/sec wind velocity mounted on two 10-m high tubular poles. The dc generators are differentially compounded, shunt-wound. Lead storage batteries of 110 cells and 216 Ah are used to stabilize the output and store the energy. A diesel generator system is available as an emergency system. Tests show that more than 90% of the power required for the initial unmodified communications system could probably have been supplied by the wind power system. The results were completely positive. Wind power stations are economically advantageous where it is very expensive to connect to the public power system, where adequate wind is available and especially when only a moderate amount of power is required. Author

N74-15769*# Scientific Translation Service, Santa Barbara, Calif.
THE UTILIZATION OF THE WIND ENERGY
Renzo Vezzani Washington NASA Feb. 1974 11 p Transl. into ENGLISH from Elettrotecnica (Milan), v. 34, Nov. 1947 p 463-464
(Contract NASw-2483)
(NASA-TT-F-15344) Avail: NTIS HC $3.00 CSCL 10B

Wind energy exploitation by very large wind power generating stations is discussed. This system is compared to other types of power generation. Author

N74-15770*# Scientific Translation Service, Santa Barbara, Calif.
SMALL WIND-ELECTRICAL INSTALLATIONS FOR EXPORT
G. R. Seidel Washington NASA Feb. 1974 11 p refs Transl. into ENGLISH from Elektrotechn. Z. (West German), v. 70, no. 5, May 1949 p 158-160
(Contract NASw-2483)
(NASA-TT-F-15350) Avail: NTIS HC $3.00 CSCL 10B

The design and operational problems are reported that are associated with wind power generating plants similar to the American wind charger. The potential market for such devices is discussed. Author

N74-15771# European Space Research and Technology Center, Noordwijk (Netherlands).
DESIGN, DEVELOPMENT AND TESTING OF A PAYLOAD EJECTION SYSTEM ON BOARD A SOUNDING ROCKET [ETUDE, DEVELOPPEMENT ET ESSAIS D'UN SYSTEME D'EJECTION DE CHARGE UTILE EMBARQUEE SUR FUSEE-SONDE]
V. Laurent Paris ESRO Aug. 1973 38 p In FRENCH; ENGLISH summary
(ESRO-TN-88-ESTEC) Avail: NTIS HC $4.00

A description of the technical requirements involved in the design, manufacture and development of a pneumatic system designed to eject payloads from sounding rockets is given. Reasons are set forth regarding the choice of certain special arrangements, such as the unlocking subsystem, designed to keep a movable part very rigidly in contact with a fixed part and to separate these two parts at a given time very rapidly. Results of ground tests and in-flight tests are presented. Author (ESRO)

N74-15772# European Space Research and Technology Center, Noordwijk (Netherlands).
PERFORMANCE ANALYSIS OF A NEW TYPE OF DC/DC BUCK REGULATOR [ANALYSE DU FONCTIONNEMENT D'UN REGULATEUR ABAISSEUR CC/CC D'UN TYPE NOUVEAU]
A. Capel Sep. 1973 25 p refs In FRENCH; ENGLISH summary
(ESRO-TN-115-ESTEC) Avail: NTIS HC $3.25

A new type of control loop is presented for dc/dc regulators, based on the use of a linear analog to the pulsewidth modulator. This function, which is independent of operating frequency, permits high sampling frequencies. Combined with a limiter of the analog input, limitation characteristics are automatically available, without any extra sensing on the hot line. The independence of parameters is demonstrated, and application of the loop to control the regulator output characteristics is shown. This flexibility finds useful applications in high-power systems (1 kW) by permitting parallel unit operations and utilization of modulator units.
Author (ESRO)

N74-15773# Societe des Accumulateurs Fixes et de Traction, Romainville (France). Dept. Accumulateurs Alcalins.
STUDY OF NICKEL-CADMIUM BATTERIES FOR USE IN APPLICATIONS SATELLITES, PHASE 1 [ETUDE DES ACCUMULATEURS Ni-Cd POUR UTILISATION DANS LES SATELLITES D'APPLICATION PHASE 1]
S. Font Nov. 1972 66 p In FRENCH
(Contract ESTEC-1358/71-SL)
(DT/SAS-298/72-SF/JM; Rept-01; ESRO-CR(P)-323) Avail: NTIS HC $5.50

Several aspects of a nickel cadmium VO 235 battery for use in ESRO application satellites were investigated. The abnormal aging of this battery in the case of strong discharge depth and geostationary cycling, as well as the definition of different electrical procedures to obtain batteries with selected homogeneous and reliable characteristics, are described. ESRO

N74-15774# Council for Scientific and Industrial Research, Pretoria (South Africa). Chemical Engineering Research Group.
PULSE TECHNIQUE FOR EVALUATING DEPOLARIZATION BY MANGANESE DIOXIDE IN LECLANCHE POROUS ELECTRODES
Indru Olivier May 1973 53 p refs
(PB-224172/7GA; CSIR-SR-CENG-012; ISBN-0-7988-0384-3) Avail: NTIS HC $4.75 CSCL 07D

A galvanostatic interruption technique is described for obtaining current-free potentials from a scaled-down Leclanche test cell under constant current discharge, in which sampling of the instantaneous cell potential at the end of the interruption interval is effected by electronic means. The total time taken for the potential so obtained to drop to a predetermined end-point value is used as a measure of the depolarising activity of the MnO2 sample under investigation. To ascertain the significance of the sampled potentials, recovery upon interruption is examined for a wide range of experimental conditions and the implications on choice of interval are discussed. (Modified author abstract)
GRA

N74-15775# Teledyne CAE, Toledo, Ohio.
ELECTRIC GENERATOR SET, GAS TURBINE ENGINE DRIVEN, SKID-MOUNTED, ALTERNATING CURRENT, MULTI-FREQUENCY Final Technical Report, 1 May - 1 Oct. 1972
10 Nov. 1972 258 p ref
(Contract DAAK02-72-C-0311; DA Proj. 1G6-63702-DG-11) (AD-761125; TCAE-1244) Avail: NTIS CSCL 10/2

The report concludes a study performed on 30 KW and 60 KW ground power units for the U.S. Army Sections 2.0 through 6.0 provide the details of the introduction; generator set description; the engines, electrical systems and packaging investigations and discussions. These sections contain the background data from which this summary was derived. After the section introduction, a detailed discussion of results is presented comparing the performance, physical characteristics, development, demonstration tests and costs of the six (6) proposed 30 KW turbine ground power sets. These comparisons are then discussed for a derivative 60 KW turbine ground power unit. Conclusions and recommendations are made. Author (GRA)

N74-15776# Informatics, Inc., Rockville, Md.
SOVIET GEOTHERMAL ELECTRIC POWER ENGINEERING, REPORT 2
V. A. Stevovich Dec. 1972 85 p refs
(Contract F44620-72-C-0053; ARPA Order 1622-3)
(AD-754947; AFOSR-73-0034TR) Avail: NTIS CSCL 10/2

Information is provided on Soviet geothermal research and engineering associated with the design, construction, and maintenance of geothermal power plants and related facilities. Besides a general outline of geothermal characteristics, emphasis in this report is on Soviet geothermal research and development, including engineering data on existing power plants, as well as those under construction and in the planning stages. Other actual and potential applications of geothermal water such as for space heating, hotwater supply, mining and construction in permafrost regions, refrigeration, air conditioning, agriculture, medical and health applications, etc., are discussed.
Author (GRA)

N74-15777# Army Foreign Science and Technology Center, Charlottesville, Va.
SOME RESULTS OF TESTING OF A SOLAR WATER HEATING INSTALLATION DURING THE HEATING SEASON
G. Ya. Umarov, R. A. Zakhidov, and R. R. Avezov 31 Oct. 1972 4 p Transl. into ENGLISH from Geliotekhnika (USSR), no. 4, 1970 p 85-86
(AD-754628; FSTC-HT-23-1011-72) Avail: NTIS CSCL 13/1

An experimental investigation of solar water heating plant with operating surface 2 sqm, mounted at the angle 50 degrees with the horizon are given. The possibility and expediency of solar energy application as a low potential heat source for the heating pump in heating regime are described. Author (GRA)

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N74-15778* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AUTOMATIC REAL-TIME PAIR-FEEDING SYSTEM FOR ANIMALS Patent
Henry A. Leon, James P. Connolly, Maurice J. Hitchman, and John E. Humbert, inventors (to NASA) Issued 1 Jan. 1974 8 p Filed 30 Nov. 1971 Supersedes N72-21052 (10 - 12, p 1559)
(NASA-Case-ARC-10302-1; US-Patent-3,782,334; US-Patent-Appl-SN-203271; US-Patent-Class-119-54; US-Patent-Class-119-51R; US-Patent-Class-119-52AF; US-Patent-Class-119-51.13; US-Patent-Class-119-51.5; US-Patent-Class-221-265) Avail: US Patent Office CSCL 06C

A pair feeding method and apparatus are provided for experimental animals wherein the amount of food consumed is immediately delivered to a normal or control animal so that there is a qualitative, quantitative and chronological correctness in the pair feeding of the two animals. This feeding mechanism delivers precisely measured amounts of food to a feeder. Circuitry is provided between master and slave feeders so that there is virtually no chance of a malfunction of the feeding apparatus, causing erratic results. Recording equipment is also provided so that an hourly record is kept of food delivery.
Official Gazette of the U.S. Patent Office

N74-15779*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 122, DECEMBER 1973
Dec. 1973 108 p refs
(NASA-SP-7011(122)) Avail: NTIS HC $3.00 CSCL 06C

This special bibliography lists 343 reports, articles, and other documents introduced into the NASA scientific and technical information system in November 1973. Author

N74-15780*+ National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES, SUPPLEMENT 121, NOVEMBER 1973
Nov. 1973 98 p refs
(NASA-SP-7011(121)) Avail: NTIS HC $3.00 CSCL 06E

This special bibliography lists 298 reports, articles, and other documents introduced into the NASA scientific and technical information system in October 1973. Author

N74-15781*# California Univ., Davis.
PINEAL MECHANISM AND AVIAN PHOTOPERIODISM Final Technical Report
L. Z. McFarland and W. O. Wilson 19 Jul. 1973 3 p refs
(Grant NGR-05-004-028)
Avail: NTIS HC $3.00 CSCL 06C

The effects of pinealectomy and/or enucleation on bird photoperiodicity were studied by observing physiological and neural system responses to darkness regimes. Neither the presence of the eyes nor the pineal gland were found essential to gonadal maturation and function in quail. Accelerated sexual maturity in both sexes was observed after enucleation. Pinealectomy did not alter this response in males but caused delayed maturation in females. G.G.

N74-15782*# Techtran Corp., Glen Burnie, Md.
THE EFFECT OF PEROXIDE OXIDATION OF MICROSOMAL LIPIDS ON THE SPECTRAL CHARACTERISTICS OF CYTOCHROME P-450
V. V. Lyakhovich, I. B. Tsyrlov, V. M. Mishin, and O. A. Gromova Washington NASA Jan. 1974 8 p refs Transl. into ENGLISH from Biokhimiya (Moscow), v. 38, no. 5, 1973 p 897-900
(Contract NASw-2485)
(NASA-TT-F-15327) Avail: NTIS HC $3.00 CSCL 06C

The influence of activation of both enzymatic and non-enzymatic lipid peroxidation systems in the rat liver microsomal fraction on the spectral properties of cytochrome p-450 and on the hydrophobity of microsomal membranes was studied. It was shown that in the course of both types of peroxidation the degree of membranous hydrophobity greatly decreased, and as a result of this cytochrome p-450 was transformed into its inactive form -- cytochrome p-420. The conversion of cytochrome p-450 into p-420 and the decrease in ANS-fluorescence intensity were completely prevented in the presence of both EDTA and phenergan which simultaneously removed the lipoperoxidative effect. Author

N74-15783*# Kanner (Leo) Associates, Redwood City, Calif.
EFFECT OF IMMOBILIZATION ON THE URINARY EXCRETION OF CALCIUM
S. Syc and A. Wedrychowski Washington NASA Feb. 1974 10 p refs Transl. into ENGLISH from Polskie Arch. Med. Wewnetrznej (Warsaw), v. 35, 1965 p 1621-1625
(Contract NASw-2481)
(NASA-TT-F-15297) Avail: NTIS HC $3.00 CSCL 06P

Urinary calcium excretion was determined in 22 patients immobilized because of myocardial or pulmonary infarction and thromblophlebitis of the inferior extremities. Among the 18 subjects in whom the daily urinary calcium output was estimated at the beginning and toward the end of the immobilization period, the calcium excretion increased in 15 patients. In 10 cases the rise was more than 100%; during the first examination it was, on the average, 115 mg calcium per 24 hours, whereas after immobilization the value attained was 259 mg. The rise in the calcium output was more pronounced among subjects who had previously been very active. Following immobilization, the calcium level in the blood increased from a mean of 9.7 to 10.4 mg per 100 ml of serum. Author

N74-15784*# Kanner (Leo) Associates, Redwood City, Calif.
MICROBIOLOGICAL INDICATORS OF STERILIZATION: GENERAL PRINCIPLES
G. Spicher Washington NASA Feb. 1974 45 p refs Transl. into ENGLISH from Zentralbl. Bakteriol., Hygiene, Infektionskr., Abt. 1, Originale A (Stuttgart), v. 4, no. 224, 1973 p 527-553
(Contract NASw-2481)
(NASA-TT-F-15328) Avail: NTIS HC $4.25 CSCL 06M

A survey is presented of general properties of microbial indicators of sterilization and of principles involved in testing sterilization procedures with such indicators. Probability theory shows it to be preferable to characterize the resistance of microbial indicators by the duration of action or dose of the agent which causes either a 50% or 99% reduction of indicators showing viable organisms. The logarithmic shape of the death curves, limited efficacy of sterilization procedures and unknown resistance of adhering organisms make it impossible to achieve absolute sterilization by definition a freeing of the object of all viable orgainisms. Sterilization only yields an object which, with a certain probability (generally very high), does not harbor viable organisms which might constitute a risk. Different indicators, showing ability of procedure to effect killing, are used for different objects and procedures. Author

N74-15785# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario). Biosciences Div.
INVESTIGATION OF HEALTH PROBLEMS RELATED TO CANADIAN NORTHERN MILITARY OPERATIONS
B. H. Sabiston and S. D. Livingstone Jul. 1973 20 p refs
(DCIEM-899) Avail: NTIS HC $3.00

Some Canadian military operations dictate rapid deployment of mobile land elements from a temperate to a northern environment and the subsequent deployment of small bodies of troops on operational patrols. Under these conditions, it is paramount to the successful accomplishment of the mission that the individual be protected maximally against environmental hazards and that his health and wellbeing be maintained. Author

N74-15786*# Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF STAPHYLOCOCCAL FIBRINOLYSIN
G. Hentschel and H. Blobel Washington NASA Feb. 1974 15 p refs Transl. into ENGLISH from Zentr. Bakteriol., Parasitenk. Abt. 1. Orig. (Stuttgart), v. 206, Mar. 1968 p 193-201
(Contract NASw-2481)
(NASA-TT-F-15358) Avail: NTIS HC $3.00 CSCL 06M

The fibrinolysin activity of 1062 samples of staphylococcal cultures from human, bovine and canine infections was tested. Forty-two of the 790 bovine samples (5.3%), 40 of the 250 human samples (15%), and 11 of the 22 canine samples (50%) were fibrinolysin positive. With the strongly fibrinolytic staphylococci, the coagulase reaction in the test tube was obscured by the action of fibrinolysin. Therefore, it is concluded that the coagulase reaction in the test tube was obscured by the action of fibrinolysin. Therefore, it is concluded that the coagulase slide test should be used in addition to the tube test to detect the coagulase reaction of strongly fibrinolytic streptococci. The method for preparation of enriched fibrinolysin is presented, whereby an 80-fold concentration has been achieved. Author

N74-15787*# Kanner (Leo) Associates, Redwood City, Calif.
QUANTITATIVE DETERMINATION OF FIBRINOLYSIN IN STAPHYLOCOCCI WITH A FIBRINOGEN COAGULASE SOLUTION
G. Hentschel and H. Blobel Washington NASA Feb. 1974 6 p refs Transl. into ENGLISH from Zentr. Bakteriol., Parasitenk. Abt. 1. Orig. (Stuttgart), v. 204, no. 3, 1967 p 322-324
(Contract NASw-2481)
(NASA-TT-F-15359) Avail: NTIS HC $3.00 CSCL 06M

A tube test for the quantitative determination of fibrinolysin was developed. The substrate was a 3% fibrinogen solution, which had been clotted by staphylococcal coagulase. The reactions were recorded after 3 hours at 37 C. Author

N74-15788*# Techtran Corp., Glen Burnie, Md.
THE ROLE PLAYED BY PARADOXICAL SLEEP IN MEMORY RETENTION
K. Leonhard and B. Roth Washington NASA Feb. 1974 16 p refs Transl. into ENGLISH from Weinzeit fur Nervenheilkunde, v. 30, 1972 p 46-57
(Contract NASw-2485)
(NASA-TT-F-15294) Avail: NTIS HC $3.00 CSCL 06P

Recent experimental investigations make it likely that the REM phases of sleep serve to keep the memory efficient. This seems to confirm the interpretation formulated regarding dreams. If experiences are to be retained in the memory, they must be activated from time to time. When awake we would renew only what seems to be logically important at the time; other experiences would be quickly forgotten. In dreams however, according to the laws of thought association and picture return, both of which are described in detail, everything that we have ever experienced returns. This seems to be due to an independent activity of the nervous system by which it maintains its function. Author

N74-15789# Defense Documentation Center, Alexandria, Va.
MEDICAL PROBLEMS OF SPACE FLIGHT Bibliography, Jan. 1968 - Feb. 1973
Oct. 1973 205 p refs
(AD-768800; DDC-TAS-73-58) Avail: NTIS CSCL 06/5

The bibliography contains references to reports pertinent to observing and measuring the various aspects of space medicine in a real or simulated space environment using men and laboratory animals. The indexes included are Corporate Author-Monitoring Agency, Subject and Personal Author. Author (GRA)

N74-15790# Kobe Univ. (Japan). Second Dept. of Physiology.
STUDIES OF THE MAMMALIAN BRAIN FUNCTION IN VITRO Annual Report, Dec. 1970 - Dec. 1972
Isamu Suda Dec. 1972 25 p
(Grant DA-CRD-AG-S92-544-67-G5)
(AD-768737; ARDG(EE)-J-293-7; AR-7) Avail: NTIS CSCL 06/16

Effects of long term (7 1/4 and 5 3/4 years) storage of the cat in frozen state at -20 C in vitro after employing a glycerol perfusion technique were investigated from modes of neuroelectrical activity and histological evidences. The following conclusions were obtained: Glycerol, even if administered via vascular systems, showed cryoprotective effects on the brain tissues as was the case of single cells; it was possible to preserve viability of nervous tissues against many years storage in frozen state; reperfusion for revival brought about enlargement of micro-clefts in tissues which might have been produced by thawing of long term frozen tissues. This may be a cause of bleeding and activity defect in the revived brain; integrated neuroelectrical activity such as brain waves and evoked potentials may be affected significantly by dissolution of functions resulted from disruption in tissues; individual nerve cell activity, on the contrary, may be preserved well essentially or augmented in activity by degenerative processes. Author (GRA)

N74-15791# Army Research Inst. of Environmental Medicine, Natick, Mass.
ARMY RESEARCH AND DEVELOPMENT TECHNICAL REPORT Annual Progress Report, 1 Jul. 1972 - 30 Jun. 1973
1 Jul. 1973 175 p refs
(DA Proj. 3A0-61101-A-91C; DA Proj. 3A0-61102-B-71R)
(AD-768715) Avail: NTIS CSCL 06/5

The research projects reported are as follows: An electrophysiologic study of prolonged hypoxia; historical analysis,

development and distribution of military environmental medical information; neurophysiological investigations of the glucose dependency of the thermoregulatory center of the hypothalamus; disease susceptibility of soldiers in harsh environments; bioenergetics related to heavy physical work ability of the soldier; development of measures to assess the impace of environmental stresses on critical military performance; development and characterization of models to study acute mountain sickness and high altitude pulmonary edema in military operations. GRA

N74-15792# Army Edgewood Arsenal, Md.
COLLECTION, DETECTION, IDENTIFICATION, AND QUANTITATION OF HUMAN EFFLUENTS
Robert I. Ellin, Richard L. Farrand, Fred W. Oberst, Charles L. Crouse, Norman B. Billups, William S. Koon, Nelson P. Musselman, and Frederick R. Sidell Oct. 1973 26 p refs
(DA Proj. 1B0-25001-A-197)
(AD-768762; EA-TR-4779; EB-TR-73007) Avail: NTIS CSCL 06/1

In a previous study of methods and instrumentation for measuring trace amounts of the total effluvia from man, only 12 compounds were identified. In the present study, using refinements of the methods, over 135 effluents have been identified. Two to three times this number of compounds were observed in the sensitive gas chromatograph-mass spectrometer (GC-MS) analytical system, but could not be identified. A variety of organic structures are included among these effluents. In addition to alcohols and ketones, unsaturated, branched, cyclic and aromatic hydrocarbons, sulfhydryl and cyano and a variety of heterocyclic compounds were found. The most significant change in the method is the replacement of the cryogenic collection system with porous polymer collectors. The latter can be used to collect effluents at room temperature, to absorb more effluents in a shorter time, can be connected in parallel to the chamber, and can be cleaned and desorbed without using vacuum. (Modified author abstract) GRA

N74-15793# Naval Aerospace Medical Research Lab., Pensacola, Fla.
DECISIONAL DIFFERENCES AMONG INDIVIDUALS: A SIGNAL DETECTION THEORY APPROACH Medical Research Progress Report no. 16
Gerald M. Long and Jack B. Shelnutt 18 Jun. 1973 29 p refs
(MF51524004)
(AD-765732; NAMRL-1185) Avail: NTIS CSCL 05/10

The applicability of current theory and measures of risk-taking (R-T) to the understanding and selection of military aviators was investigated. The project consisted of three interrelated sections: (1) an extensive review and critique of the literature in R-T, (2) the development of an alternate measure emphasizing the decisional aspects of R-T, and (3) preliminary findings of a brief study employing proposed signal detection theory measure. On the basis of the R-T literature review, a number of serious weaknesses and difficulties in existing R-T measures were enumerated. Because of these problems, an attempt was made to determine an alternative measure which stressed the decisional aspects of the R-T situation. This involved the application of the signal detection theory framework to a psychophysical task of changing signal probabilities. The validity of this approach for determining decisional differences among individuals was investigated in an auditory detection task of limited length. The results in general were favorable to this alternative approach to measuring meaningful individual differences along a statistical decision dimension. Author (GRA)

N74-15794# Memphis State Univ., Tenn. Dept. of Psychology.
CONVENTIONAL AND HIGH FREQUENCY HEARING OF NAVAL AIRCREWMEN AS A FUNCTION OF NOISE EXPOSURE Final Report, May 1971 - Aug. 1973
John L. Fletcher 31 Aug. 1973 48 p refs
(Contract N00014-71-C-0354; NR Proj. 197-002)
(AD-766085; HRL/2) Avail: NTIS CSCL 06/16

Conventional (.5, 1, 2, 3, 4, and 6 kHz) and high frequency (8, 9, 10, 11, 12, 13, 14, 15, 16, and 18 kHz) hearing was tested of US Navy aviators flying primarily prop, jet, or helicopter aircraft for varying amounts of hours. Results show a progressive decline in hearing as a function of number of hours flight time. They also reveal high frequency hearing to be most affected as well as earlier to deteriorate from noise exposure. These results suggest high frequency hearing testing could be of significant value in hearing conservation programs in early detection of loss and in evaluating effectiveness of hearing conservation measures. Author (GRA)

N74-15795# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Computer Science.
PRODUCTION SYSTEMS: MODELS OF CONTROL STRUCTURES
Allen Newell May 1973 68 p refs
(Contract F44620-70-C-0107; Grant MH-07732; ARPA Order 827)
(AD-768990; AFOSR-73-1904TR) Avail: NTIS CSCL 05/10

An exposition is made of the potentiality of production systems as a model of the detailed control structure of humans. A detailed treatment is given of the elementary Sternberg reaction time experiments in binary classification as a means of exhibiting the uses of production systems. The investigation leads to a hypothesis for these experiments different from the usual one of exhaustive search, called the Decoding Hypothesis.
Author (GRA)

N74-15796# North Carolina Univ., Chapel Hill. Auditory Research Lab.
PSYCHOACOUSTIC AND ELECTROPHYSIOLOGIC STUDIES OF HEARING UNDER HYPERBARIC PRESSURE Summary Report, 1 Jun. 1970 - 31 May 1973
William G. Thomas and Joseph C. Farmer (Duke Univ.) 1 Jun. 1973 62 p refs
(Contract N00014-67-A-0321-0005; NR Proj. 101-027; NR Proj. 309-020)
(AD-761212; UNC/ARL-73-1) Avail: NTIS CSCL 06/19

Work performed includes: calibration of laboratory standard type-L condenser microphones to a simulated depth of 990 feet (31 ATA); calibration of standard audiometric earphones to a simulated depth of 990 feet (31 ATA); and measurement of human auditory thresholds during deep, saturation dives in helium-air. Human threshold data were collected at numerous depths during compression and decompression for air conduction and bone conduction to a simulated depth of 990 feet (31 ATA). Electrophysiological measurements were recorded from experimental animals under similar conditions. (Modified author abstract) GRA

N74-16303* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FUNGI AND BACTERIA
Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 2 p refs (For availability see N74-16292 07-20) CSCL 06M

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N74-15797*# Scientific Translation Service, Santa Barbara, Calif.
HIGH ALTITUDE AND SPACE SUITS
S. M. Alekseyev and S. P. Umanskiy Washington NASA Jan. 1974 491 p refs Transl. into ENGLISH of the book "Vysotnyye i Kosmicheskiye Skatandry" Moscow, Mashinostr., 1973 280 p
(Contract NASw-2483)
(NASA-TT-F-15165) Avail: NTIS HC $26.75 CSCL 06K

Domestic and foreign experiences derived in designing space suits for human high altitude and space flights are reported. The properties of the medium in which the flights take place, the physical flight factors and their influence upon the human body are discussed. The bases of the theory and method of

designing space suit systems and parts are briefly presented. The book is designed for specialists working in the field of design, production, and testing of equipment for pilots and cosmonauts. It is also useful to the engineering-technical personnel working on the creation of life support systems for the crews of modern spacecraft. Author

N74-15798*# Techtran Corp., Glen Burnie, Md.
LIVING ON ANOTHER PLANET
B. Konovalov Washington NASA Jan. 1974 9 p Transl. into ENGLISH from Izv. (Moscow), 27 Oct. 1973 p 5
(Contract NASw-2485)
(NASA-TT-F-15262) Avail: NTIS HC $3.00 CSCL 06F

A six month evaluations of an artificial biosphere is reported. Some problems encountered in designing and operating the biosphere are described and the efficiency of chlorella and higher plants as oxygen producers and environmental purifiers is evaluated. Author

N74-15799*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
GENERALIZED ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEM COMPUTER PROGRAM (G189A) CONFIGURATION CONTROL Phase 1 Final Report, 2 Apr. - 31 Oct. 1973
R. L. Blakely 31 Dec. 1973 49 p
(Contract NAS9-13404)
(NASA-CR-134182; MDC-G5084) Avail: NTIS HC $4.50 CSCL 06K

A G189A simulation of the shuttle orbiter EC/ISS was prepared and used to study payload support capabilities. Two master program libraries of the G189A computer program were prepared for the NASA/JSC computer system. Several new component subroutines were added to the G189A program library and many existing subroutines were revised to improve their capabilities. A number of special analyses were performed in support of a NASA/JSC shuttle orbiter EC/LSS payload support capability study. Author

N74-15800# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A HIGH RESOLUTION MEASUREMENT OF THE ANISOTROPIC MODULATION TRANSFER FUNCTION OF THE HUMAN VISUAL SYSTEM M.S. Thesis
Roland David Guidry Jun. 1973 148 p refs
(AD-768344; GA/EE/73-1) Avail: NTIS CSCL 06/16

Apparatus and procedures were designed to measure differences in threshold perception of gratings for 12 grating orientations and 9 spatial frequencies (2.3 to 20.4 cycles per degree). Gratings were generated on an oscilloscope and rotated electronically at 15 degree increments using an image rotation device designed for this experiment. Fifteen subjects were tested using a multiple staircase paradigm: 12 staircases (one for each orientation) were run concurrently and randomly intermixed, with spatial frequency held constant. Results are presented as plots of contrast sensitivity versus grating orientation for each spatial frequency tested. Considerable variation occurred among the subjects, both in orientational preferences and experimental consistency. Three subjects were classified as meridional amblyopes, three as classics (equal acuity for horizontal and vertical gratings but lower acuity for oblique gratings), and the remainder as having slight or inconsistent orientational preferences (from one spatial frequency to another). (Modified author abstract) GRA

N74-15801# Army Aeromedical Research Lab., Fort Rucker, Ala.
STUDY OF FLIGHT ENVIRONMENT EFFECTS ON HELICOPTER GUNNER
Carl Larson (Drexel Univ.), Edward Wells (Drexel Univ.), and Burton H. Kaplan Jun. 1973 39 p refs
(AD-766224; USAARL-73-15) Avail: NTIS CSCL 06/19

Disorientation periods of a helicopter gunner in the conduct of his task during a planned flight profile were investigated through the use of a computerized mathematical model of the vestibular system. Flight attitude and crewman seat change data were used as input to the model and crewman nystagmus rates and perceived angular sensations were predicted. These output data were then compared to actual onboard flight observations of crewman status and well being. The mathematical model was found to accurately predict periods of disorientation that coincided with those observed and were manifested by either excess nystagmus rates, perceived sensations of motion, or a combination of both. Rapid changes in seat angle were attributed as the primary cause of disorientation with vehicle attitude changes cross-coupled with seat angle changes, producing a secondary effect. Author (GRA)

N74-15802# Naval Postgraduate School, Monterey, Calif.
A METHOD FOR DEVELOPING A CRITERION FOR COMBAT PERFORMANCE OF NAVAL AVIATORS M.S. Thesis
Maurice Dudley Stanley, Jr. Jun. 1973 58 p refs
(AD-765679) Avail: NTIS CSCL 05/10

Current Naval aviator selection and screening procedures are based on the individual's statistical probability of completing flight training and do not determine the capability of the student to adapt to an operational environment. The resultant failure of some student aviators to complete the advanced stages of training and the ineffective performance of others in operational missions have caused a considerable financial loss and a lessening of combat readiness. A critical incident study, using 30 aviators who have combat experience, indicates that there are 10 categories of behavior which characterize effective and ineffective Naval aviators. Procedures to identify these categories early in flight training are discussed. Author (GRA)

N74-15803# California Univ., Irvine.
BIOCYBERNETICS: AN INTERACTIVE MAN-MACHINE INTERFACE Annual Technical Report, 1 Jan. - 31 Dec. 1972
R. F. Thompson and T. J. Teyler 23 Feb. 1973 122 p refs
(Contract DAHC15-72-C-0121; ARPA Order 1001)
(AD-756701) Avail: NTIS CSCL 05/8

The long range objective of this project is the development of an efficient and accurate man-machine interactive method, involving use of biofeedback control. The project deals with the capability of training a human subject to control and/or interact with complex electronic or mechanical systems. Basically the project involves the detection of bioelectrical phenomena that are analogs of ongoing cognitive processes and the use of these phenomena to control external events. The project also allows the system being controlled to communicate with the human operator in either a feedback or an interactive manner. GRA

N74-15804# Naval Postgraduate School, Monterey, Calif.
THE COMBINED EFFECTS OF HEAT AND NOISE ON AUDIO VIGILANCE IN A SIMULATED HELICOPTER ENVIRONMENT M.S. Thesis
James Loewen Eyre Sep. 1973 23 p refs
(AD-769750) Avail: NTIS CSCL 05/10

The purpose of this experiment was to determine the combined effect of heat and noise on subjects performing an audio vigilance task, simulating the conditions of a helicopter cockpit. The task was to correctly extract specific aircraft heading changes from tapes of random aircraft radio transmissions. Additionally, the subjects were required to track the light of a pursuit rotor to simulate manual demands of helo flight. Experimental conditions combined three fixed levels of temperature, and three fixed levels of recorded helicopter noise. An analysis of variance of the results indicated no significant effects of noise, temperature, or their interaction, even at the .75 level. (Modified author abstract) GRA

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N74-15805 Columbia Univ., New York.
RAMAN LASER TEMPERATURE-JUMP STUDIES Ph.D. Thesis
Douglas Hugh Turner 1972 101 p

Avail: Univ. Microfilms Order No. 73-26646

A Raman laser temperature-jump apparatus for the study of chemical reactions with relaxation times down to the 10 to the -8th power to 10 to the -7th power sec range is described. This apparatus makes use of the stimulated Raman effect in liquid nitrogen to shift the wavelength of neodymium-glass laser radiation from 1.06 microns, where the absorbance of water is very small, to 1.41 microns, where water absorbs very strongly. The kinetics of triiodide formation and proflavin dimerization were studied with this apparatus. Dissert. Abstr.

N74-15806 Minnesota Univ., Minneapolis.
STUDY OF METAL-NITROGEN BONDING IN AMMONIA AND PYRIDINE SOLUTIONS USING LASER RAMAN SPECTROSCOPY Ph.D. Thesis
Helen Strieter Hagnauer 1973 206 p
Avail: Univ. Microfilms Order No. 73-25615

A comparison of the observed metal-nitrogen stretching frequencies was made with the analogous metal-oxygen frequencies for aqueous solutions. The Raman spectra of saturated pyridine solutions of CH3Hg(II), (CH3)2Au(III), and (CH3)Pt(IV) halides, pseudohalides, and perchlorates were recorded. The Hg-py bond stretching frequency was observed at 204 cm to the -1 power and the Au-py stretching was observed at 192 cm to the -1 power. A Pt-py stretch was not observed. The symmetric pyridine ring mode for the coordinated pyridine was observed at ca. 1014 cm to the -1 power. The hg-NH3, Au-NH3, and Pt-NH3 stretching frequencies were observed at 458, 459, and 403 cm to the -1 power, respectively. Dissert. Abstr.

N74-15807*# California Univ., Santa Cruz. Div. of Natural Sciences.
STABILITIES OF NITROGEN CONTAINING HETEROCYCLIC RADICALS AND GEOMETRICAL INFLUENCES ON NON-RADIATIVE PROCESSES IN ORGANIC MOLECULES Progress Report, Jul. 1970 - Sep. 1971
Earl M. Evleth Sep. 1971 82 p refs
(Grant NGL-05-061-004)
(NASA-CR-136620) Avail: NTIS HC $6.25 CSCL 07C

Theoretical and experimental work on generating radicals by removal of a hydrogen atom from pyrrole, imidazole, indole, and carbazole is reported. Photophysical studies on indolizine and related aza-derivatives show that materials having large S2-S1 energy gaps might exhibit upper state fluorescence. Photodecomposition quantum yields of a series of sterically hindered p-aminobenzene diazonium cations in water were found structurally and wavelength dependent and unquenched in aqueous sodium bromide solutions. Photodecomposition of diazonium materials did not produce a metastable species with a longer lifetime than 1 msec. Author

N74-15808# Bureau of Mines, Pittsburgh, Pa. Energy Research Center.
ANALYSES OF TARS, CHAR, GASES, AND WATER FOUND IN EFFLUENTS FROM THE SYNTHANE PROCESS Technical Progress Report
Albert J. Forney, William P. Haynes, Stanley J. Gasior, Glenn E. Johnson, and Joseph P. Strakey, Jr. Jan. 1974 12 p refs
(BM-TPR-76) Avail: NTIS HC $3.00 CSCL 07D

Extensive studies were made of the various effluents found in the synthane coal-to-gas process. Analyses were made of the waters, gases, and trace elements present in some of the streams. Analyses results show that the water effluent area needs further research. Author

N74-15809# Defence Research Establishment Valcartier (Quebec).
THE ULTRAVIOLET FLASH PHOTOLYSIS OF OZONE AND THE REACTIONS OF O(1 D) AND O2 ('SIGMA G PLUS)
D. R. Snelling Nov. 1973 30 p refs
(DREV Proj. 95-10-42)
(DREV-TN-2072/73) Avail: NTIS HC $3.50

The decomposition of ozone has been studied following a short duration ultraviolet light pulse. From an analysis of the 03 decomposition curves for O3:N2, O3:N2:O2 mixtures it is shown that the relative rate constant for O(d-1) deactivation by N2 and O2 is given by K sub N2/K sub O2 =0.7 + or - 0.3. It is also shown that 02(1 sigma (+)g) is formed in at least 75% of the collisions in which O(D-1) is deactivated by O2. The rate constants of the reactions 02 + 03 yields 202 + 0 and 0 + 02 + 02 yields 03 + 02 are found to be (2.3 + or - 0.5) x 10 to -11th power cu cm molecule -1s-1 and (5.0 + 0.5) x 10 to the -34th power cm to the 6th power molecule -2s-1, respectively at (295 +1) k. Author

N74-15810# Toulouse Univ. (France).
MODELIZATION AND CHARACTERIZATION OF BORON DIFFUSION PHENOMENA IN SILICON Ph.D. Thesis [MODELISATION ET CARACTERISATION DES PHENOMENES DE DIFFUSION DU BORE DANS LE SILICIUM]
Andre Dequidt 1973 130 p refs In FRENCH
Avail: NTIS HC $8.50

After a brief summary on the physical mechanisms involved in boron diffusion in silicon, a numerical procedure for determining impurity redistribution of boron atoms and junction formation in silicon are discussed. Data are also given on variations of diffusion coefficients with impurity concentration, effects of electric fields, retro-diffusion phenomena in gas-silicon interfaces, and segregation of gas-silicon interfaces. Transl. by E.H.W.

N74-15811# Defence Research Establishment Valcartier (Quebec).
INFRARED CHEMILUMINESCENCE FROM THE REACTIONS OF OXYGEN ATOMS WITH HALOMETHANES
S. J. Arnold, G. H. Kimbell, and D. R. Snelling Nov. 1973 24 p refs
(Proj. 97-01-39)
(DREV-TN-2094/73) Avail: NTIS HC $3.25

Infrared chemiluminescence from vibrationally excited CO was observed when CH3Cl, CH2Cl2, CHCl3 or CH2Br2 was introduced into a stream of oxygen atoms. Emission from vibrationally excited HCl was also observed from CH2Cl2 and CHCl3. The mechanisms describing the reactions of oxygen atoms with these molecules are discussed in detail. The postulated reaction step responsible for the formation of excited CO is presented. Author

N74-15812# Environmental Protection Agency, Research Triangle Park, N.C.
CONTRIBUTION TO THE MEASUREMENT OF THE OXIDES OF NITROGEN (NO, NO2) BY THE GRIESS-SALTZMANN METHOD
P. Bourbon, J. Alary, J. Esclassan, and F. Alengrin [1973] 33 p Transl. into ENGLISH of paper presented at Technicon Intern. Symp., Paris, Nov. 1971
(APTIC-51087) Avail: NTIS HC $3.75

The Griess-Saltzmann colorimetric technique was modified and used to determine significant concentrations of NO and NO2 found in atmospheric pollution by emission products. The capture efficiency of the naphthylethylenediamine coupling reagent was improved by using a single wash bottle and by maintaining an excess of amine in the reagent so as not to reduce the rate of coupling ability. Separate determinations of NO and NO2 required standardized solutions of NaNO2 and christalline chromic anhydrite for conversion of NO to NO2. The total quantity of NO was then calculated from the sum of the NO2 quantities found in the absorption bottles. G.G.

N74-15813# Lockheed Missiles and Space Co., Palo Alto, Calif. Research Lab.
SILVER/SILVER CHLORIDE ELECTRODES: SURFACE MORPHOLOGY ON CHARGING AND DISCHARGING Technical Report, 26 Apr. - 1 Jul. 1973
T. Katan, S. Szpak, and Douglas N. Bennion 8 Oct. 1973 39 p refs
(Contract N00014-73-C-0397)
(AD-768371; LMSC-D354723; TR-1) Avail: NTIS CSCL 07/4

Transport modes were determined from examinations of morphology for electrochemical oxidation and reduction within electrodes consisting of beds of silver spheres 37.2 micrometers in diameter in 1 N KCl and subjected to 5.0 mA/sq cm applied current density. Oxidation proceeded via silver dissolution, probably at dislocation sites, followed by diffusion and, then, deposition of AgCl in characteristic, bulbed mounds which grow together to form layers of approximately uniform thickness. AgCl film thickness, for the case of partially covered underlying silver, was

about 3,500 Angstroms, and distance from silver dissolution pits to AgCl deposition sites was found to be increased, from 4,000 to 40,000 Angstroms, as the local transfer current density became larger within the sphere bed. Reduction of anodically formed AgCl on partially covered silver proceeded by an opposite path: solution and diffusion of AgCl, and deposition of silver on preferred sites of surrounding bare silver surface. Author (GRA)

N74-15814# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
PROPERTIES OF GLASSES IN SOME TERNARY SYSTEMS CONTAINING BaO AND SiO2
Given W. Cleek and C. L. Babcock (Ariz. Univ., Tucson) Sep. 1973 43 p refs
(NBS-Mono-135; LCC-73-600135) Avail: SOD HC $0.70 as C13.44:135

The glass forming regions in six ternary oxide systems containing BaO, SiO2 and a third oxide were determined. The properties of the resulting glasses were measured and the results are reported. The data on refractive indices, dispersions and specific volumes were evaluated by computer methods in an attempt to identify substructures containing the cations present in the glasses. Author

N74-15815# Bureau of Mines, Pittsburgh, Pa. Mining and Safety Research Center.
TOXIC PRODUCTS FROM BURNING OF FIRE-RESISTANT MATERIALS Technical Progress Report
Allan F. Smith and Joseph M. Kuchta Feb. 1973 23 p refs (BM-TPR-66) Avail: NTIS HC $3.25

A study was made of toxic products produced by burning eight fire-resistant mine conveyor belts, a brattice cloth, and an electrical cable insulation obtained from laboratory scale burning experiments under various air-flow conditions. Generally, CO product concentrations for most materials were noticeably higher than the NO2 and HCl levels that were measured; also, no phosgene was detected. However, several of the fire resistant belt samples yielded HCl concentrations that were above the reported lethal level for 1/2-to 1-hour exposures, although these data were limited to flow conditions where air dilution effects were small; the belt materials that showed this behavior included samples of polyvinyl chloride, styrene butadiene, styrene butadiene blends, and a British neoprene which yielded the greater amount of toxic vapor. In addition, some results are presented on the phosphoric acid concentrations that may be produced from the decomposition of ammonium dihydrogen phosphate when dispersed on a burning coalbed. Author

N74-15816# Aerodyne Research, Inc., Burlington, Mass.
EVALUATION OF ATMOSPHERIC RELEASE TECHNIQUES FOR ATOMIC URANIUM AND THORIUM Interim Technical Report, 23 Jan. - 23 Jun. 1973
M. Camac Jun. 1973 44 p refs
(Contract F30602-73-C-0162; ARPA Order 1649; AF Proj. 1649)
(AD-768624; ARI-RR-23; RADC-TR-73-285) Avail: NTIS CSCL 07/2

Because certain simple uranium and thorium oxides exhibit ionization potentials which are lower than their metal-oxygen bond strengths their low temperature and pressure chemistry can result in the production of stable ionized species. Release of uranium or thorium vapor in the presence of ambient atomic and molecular oxygen in the upper atmosphere may result in the formation of stable ionic metal clouds which extend over large volumes. Radar and optical observation of these clouds could yield information about upper atmospheric properties. This report reviews a number of techniques for the release of U and Th which may be adaptable to field experimental conditions. The techniques reviewed include the release of volatile compounds containing U and Th, evaporation by chemical and electrical heating, and exploding wires. Author (GRA)

N74-15817# Army Coating and Chemical Lab., Aberdeen Proving Ground, Md.
THERMAL-OXIDATIVE STABILITY OF AUTOMOTIVE DIESEL FUELS Interim Report
Maurice E. LePera Feb. 1973 42 p refs
(DA Proj. 1T0-62105-A-106)
(AD-758146; CCL-321) Avail: NTIS CSCL 21/4

The thermal oxidation characteristics of diesel fuels are studied. Because of the absence of any laboratory bench-scale techniques designed to predict these fuel filter plugging and/or injector fouling tendencies, initial experimentation was directed towards developing an accelerated thermal-oxidation technique. To establish valid test conditions actual diesel fuel system temperatures were obtained from engineering and service (E and S) test programs and also monitored under road dynamometer testing. A second attempt involved the use of an ASTM-CRC fuel coker which was operated in a recycle mode to simulate the geometry of automotive diesel fuel systems. Initial experiments with this technique have revealed its capability to differentiate diesel fuel quality in terms of thermal-oxidation stability. Author (GRA)

N74-15818# National Bureau of Standards, Washington, D.C. Physical Chemistry Div.
CHEMICAL KINETICS DATA SURVEY. 4: PHOTOCHEMICAL AND RATE DATA FOR TWELVE GAS PHASE REACTIONS OF INTEREST FOR ATMOSPHERIC CHEMISTRY Interim Report
Robert F. Hampson Aug. 1973 130 p refs
(NBS Proj. 3160409)
(AD-769266; NBSIR-73-207) Avail: NTIS CSCL 07/5

Photochemical and rate data have been evaluated for twelve gas phase reactions of interest for the chemistry of the stratosphere. The results are presented in data sheets, one for each reaction. For each reaction the data are summarized. A preferred value is given for the rate constant or the primary quantum yield and photoabsorption cross section. Author (GRA)

N74-15819# New York Univ., N.Y. Magneto-Fluid Dynamics Div.
LONG-RANGE CORRELATIONS IN KINETIC THEORY
Chelluri C. A. Sastri Oct. 1973 80 p refs
(Grant AF-AFOSR-2053-71; AF Proj. 9749)
(AD-768595; MF-72; AFOSR-73-1238TR) Avail: NTIS CSCL 07/4

It is shown that macroscopic correlations in a fluid are conserved for macroscoptically long times. The equations of conservation can be written in a form independent of the density of the fluid and are therefore valid for a liquid as well as a gas. For the purpose of describing correlations in a rarefied gas, a generalization of the Boltzmann equation is suggested which not only gives the correct macroscopic correlation equations but satisfies certain compatibility criteria. Author (GRA)

N74-15820# Horizons Research, Inc., Cleveland, Ohio.
PREPARATION OF AN ELASTOMERIC POLY (ARYLOXPHOSPHAZENE) COPOLYMER Final Report, 13 Apr. - 13 Oct. 1973
Kenneth A. Reynard, Arthur H. Gerber, and Selwyn H. Rose Oct. 1973 13 p refs
(Contract N00024-73-C-5392)
(AD-769104) Avail: NTIS CSCL 07/3

The (C6H5O)2PN-(4-C2H5C6H4O)2PN)n elastomer was prepared in quantities totaling 5 kg for evaluation as a flame-retardant thermal insulation. The copolymers were characterized by low chlorine content (-0.1%), intrinsic viscosities of 1.7 - 2.8 dl/g (benzene 30C) and C6H5O/4-C2H5C6H4O substituent ratios of 1:1. Author (GRA)

N74-15821# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
INVESTIGATION OF EXPLOSION OF PORTABLE LIQUID OXYGEN/LIQUID NITROGEN GENERATING PLANT Final Report
M. Perlman 24 Sep. 1973 12 p refs
(AD-768744; NADC-73204-30) Avail: NTIS CSCL 07/1

An investigation was made to determine the possible cause of an explosion in the portable air separation plant operated by the Compressed Gas School, Portsmouth Naval Shipyard, Virginia. Plant intake air and filtration bed residues were analyzed. A hydrocarbon oil residue was found in the silica gel filtration bed. Author (GRA)

N74-15822# Calspan Corp., Buffalo, N.Y.
EXPERIMENTAL STUDIES OF PHOTOIONIZATION PROC-

ESSES IN AIR Final Technical Report, 1 May 1971 - 31 Aug. 1973
Walter H. Wurster, Paul V. Marrone, and Thomas M. Albrehcinski Oct. 1973 61 p refs
(Contract N00014-71-C-0387; ARPA Order 1479)
(AD-768913; CALSPAN-AI-3107-A-4) Avail: NTIS CSCL 07/5

The experimental program described herein was designed to investigate vacuum ultraviolet radiation processes in air, with particular emphasis directed at the interaction of shock-induced nonequilibrium radiation with gaseous species. The program was divided into three main tasks which were: (1) To perform (NO) absorption measurements using a shock-tube splitter plate technique. (2) To investigate VUV excitation mechanisms using sidewall radiation overshoot measurements. (3) To perform endwall radiation measurements of the advancing shock front to verify previously developed excitation and radiative flux models. The results of this program are summarized. (Modified author abstract) GRA

N74-15823# Arizona State Univ., Tempe. Dept. of Physics.
STUDIES IN BEAM-FOIL SPECTROSCOPY Final Report, 1 Sep. 1969 - 31 Aug. 1972
Stanley Bashkin Wright-Patterson AFB, Ohio ARL Nov. 1973 27 p refs
(Contract F33615-70-C-1007; AF Proj. 7885)
(AD-768964; ARL-73-0168) Avail: NTIS CSCL 07/4

The report discusses research in beam-foil spectroscopy. Specific illustrations are given of the contributions the project made to the excitation of spectral lines, the construction of energy-level diagrams, the measurements of level mean lives and Lande g-values, production of soft X-rays, Stark and Zeeman effects, applications to astrophysics, technical improvements, and the stimulation of beam-foil and related research in other laboratories. Both experimental and theoretical advances are summarized. (Modified author abstract) GRA

N74-15824# Georgia Inst. of Tech., Atlanta. School of Physics.
MASS SPECTROMETRIC STUDY OF MOBILITY, DIFFUSION, AND REACTIONS OF IONS IN GASES Final Report, 1 Jul. 1971 - 30 Sep. 1973
Earl W. McDaniel 1 Oct. 1973 19 p refs
(Grant AF-AFOSR-2097-71; AF Proj. 9767)
(AD-768608; AFOSR-73-1901TR) Avail: NTIS CSCL 07/4

Research on slow ions in gases is described. The research dealt with the measurement of ionic mobilities, diffusion coefficients, and reaction rates. Emphasis was placed on studies of clustering of K(-) ions in N2, H2, He, Ne, Ar, O2, NO, CO, and CO2; on tests of the Wannier diffusion equations; on the differences in behavior of K(-) ions in N2 and CO; and on measurements on ions, formed from CO, drifting in carbon monoxide gas. Improvements in the experimental apparatus and analytical techniques are described. (Modified author abstract) GRA

N74-15825# New York Univ., N.Y. School of Engineering.
CATALYTIC OXIDATION OF SULFUR DIOXIDE USING ISOTOPIC TRACERS Final Report
John Happel and Miguel A. Hnatow Aug. 1973 36 p refs
(Grant EPA-R-801312)
(PB-224305/3GA; EPA-650/2-73-020) Avail: NTIS HC $3.00 CSCL 07D

The report gives results of a study of the oxidation of SO2 over a commercial vanadium pentoxide catalyst, using an all-glass, essentially gradientless reactor at 470-480C and at concentrations up to several percent of SO2. A theoretical development was derived for the use of isotopic tracers to study the kinetics and mechanism of complex catalytic reactions. Relationships developed on the basis of steady state conditions are combined with principles of thermodynamics and transition state theory. Data were obtained using radioactive sulfur 35 and the stable isotope oxygen 18 as tracers. The employment of two tracers simultaneously and the employment of more than one level of marking while still maintaining a fixed overall reaction velocity were often advantageous. GRA

N74-15826# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
COMPOSITIONAL ANALYSIS OF LEAD LANTHANUM ZIRCONIUM TITANATE
James H. Muntz Aug. 1973 14 p
(AF Proj. 7360)
(AD-769341; AFML-TR-73-137) Avail: NTIS CSCL 07/2

Lead lanthanum zirconium titanate has shown promise as an electronic ceramic. The composition of the material is important to provide the proper physical and electronic properties. Wet chemical analysis does not always give adequate results and an alternate method of analysis was developed. With this method the lead is determined by an atomic absorption technique and La, Ti, and Zr determined by optical emission technique. Accuracy is adequate to characterize the composition of the synthesized material. (Modified author abstract) GRA

N74-15827# Army Foreign Science and Technology Center, Charlottesville, Va.
CHANGE IN RADIATION-CHEMICAL STABILITY OF PbN6 BY HETEROPHASE ADDITIVES
Yu. A. Zakharov, S. M. Ryabykh, and V. D. Minakov 2 Aug. 1973 10 p refs Transl. into ENGLISH from Izv. Politekhn. Inst. (Tomsk), v. 251, 1970 p 8-14
(AD-769471; FSTC-HT-23-161-73) Avail: NTIS CSCL 07/5

Change in the radiation-chemical stability of lead azide by heterophase additives is discussed. Additives included ZnO, CdO, CO2O3, and NiO. GRA

N74-15828# Ballistic Research Labs., Aberdeen Proving Ground, Md.
THE PHOTOLYSIS OF T-BUTYL NITRITE IN HYDROCARBON SOLUTION
Lester P. Kuhn and Alan C. Duckworth Aug. 1973 17 p refs
(DA Proj. 1T1-61102-B-13A)
(AD-768782; BRL-MR-2316) Avail: NTIS CSCL 07/5

The photolysis of t-butyl nitrite in hydrocarbon solvents having abstractable hydrogen atoms results in the formation of t-butanol and solvent-derived nitroso dimer and/or oxime. The quantum yield is higher in cyclohexene than in cyclohexane or cyclopentane. There are many side reactions, two of which are photochemical decomposition of nitroso dimer and the Bamberger reaction. Author (GRA)

N74-15829# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
HOT CORROSION OF METALS, ALLOYS AND CERAMICS Final Report, Jun. 1971 - Jun. 1973
George F. Uhlig Sep. 1973 11 p
(AF Proj. 7021)
(AD-769340; ARL-73-0147) Avail: NTIS CSCL 11/6

A knowledge of the mechanism of accelerated oxidation due to the presence of sodium sulfate, called Hot Corrosion, on metals is fundamental to the design and improvement of jet aircraft gas turbines. The reaction/vaporization behavior of sodium sulfate on hot pressed oxides and on platinum was studied using continuous weight change versus time measurements. In addition, the hot corrosion behavior of TD Nickel-Chromium was also studied using continuous weight change versus time measurements. The major accomplishments of the research effort are summarized and the publications generated under this program are listed. Author (GRA)

N74-15830# Florida Univ., Gainesville. Dept. of Chemistry.
TRACE SPECTROMETRIC FLAME ANALYSIS AND GAS CHROMATOGRAPHIC DETECTORS RELATED TO JET ENGINE OIL ANALYSIS AND GAS DETECTION Final Report, 1 Nov. 1969 - 31 Aug. 1973
James D. Winefordner 1973 15 p refs
(Grant AF-AFOSR-1880-70; AF Proj. 9536)
(AD-769298; AFOSR-73-1968TR) Avail: NTIS CSCL 07/3

The report briefly summarizes research on trace spectrometric flame analysis and gas chromatographic detectors related to jet engine oil analysis and gas detection at the University of Florida consists of fundamental, instrumental and applied studies of atomic and molecular emission, atomic absorption, and atomic and molecular fluorescence of gases and of development of gas chromatographic detectors. By means of such studies, new and

improved selective, sensitive methods of trace analysis of elements and molecules in the gas state or convertible to the gas state are being developed. Special emphasis has been given to rapid simultaneous and rapid sequential multielement analysis of several elements or species. A list of publications is included. (Modified author abstract) GRA

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N74-15831* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECORDER/PROCESSOR APPARATUS Patent
Ivan H. Shim and John J. Stelben, inventors (to NASA) Issued 25 Dec. 1973 20 p Filed 7 Sep. 1971 Supersedes N73-31089 (11 - 22, p 2631) Sponsored by NASA
(NASA-Case-GSC-11553-1; US-Patent-3,781,902; US-Patent-Appl-SN-177985; US-Patent-Class-346-24; US-Patent-Class-34-162; US-Patent-Class-95-89R; US-Patent-Class-178-6.7R; US-Patent-Class-219-216; US-Patent-Class-219-388; US-Patent-Class-346-108; US-Patent-Class-346-138) Avail: US Patent Office CSCL 14C

An apparatus is described for recording a data input on, a thermally processible storage medium. A light source, whose intensity is modulated in response to the incoming data input, generates a raster in conformance with incoming timing/control signals so as to expose a latent image of the input information on the storage medium. A rotating drum in conjunction with an incrementally driven lens carriage associated with the laser optical system provides the raster generation. The drum is automatically loaded with the storage medium from a supply means and automatically unloaded to a thermal processor upon completion of recording. The latent image is processed by the controlled application of heat so as to produce an actual displayable image corresponding to the data input at the output of the apparatus. Official Gazette of the U.S. Patent Office

N74-15832 George Washington Univ., Washington, D.C.
A GENERAL-PURPOSE CONVERSATIONAL SOFTWARE SYSTEM FOR THE ANALYSIS OF DISTORTED MULTISURFACE ANTENNAS Ph.D. Thesis
William Landy Cook, III 1973 147 p
Avail: Univ. Microfilms Order No. 73-23722

The problem of calculating the radiation patterns of large reflecting antennas which are undergoing structured deformations is of considerable importance to the field of microwave communications. Typical examples of this problem arise in the determination of the effects of temperature gradients on antennas mounted on orbiting satellites, or the effects of wind and gravity loads on earth station antennas. The design philosophy which guided the development of the program is discussed, as well as the means by which these goals were achieved. Of particular concern is the formulation of the discrete element approach, in which the reflecting surface is represented by a finite number of triangular or quadrilateral surface elements, whose points of connection are referred to as grid points. The equation defining the underformed surface is specified for each element. Structural deformations are defined in terms of six displacement components at each grid point. Dissert. Abstr.

N74-15833 British Broadcasting Corp., Kingswood (England). Research Dept.
AN APPRAISAL OF THE USE OF HOLOGRAPHIC TECHNIQUES IN TELEVISION SYSTEMS OF BROADCAST QUALITY
E. W. Taylor Dec. 1973 14 p refs
(BBC-RD-1973/39) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

Brief accounts are given of the theoretical and practical aspects of the preparation of a hologram and the occurrence of the speckle pattern. The use of holographic techniques in a television transmission system is examined in detail and it is concluded that it does not appear feasible to develop such a system. Author

N74-15834 British Broadcasting Corp., Kingswood (England). Research Dept.
DIGITAL SOUND SIGNALS: MULTIPLEXING SIX HIGH-QUALITY SOUND CHANNELS FOR TRANSMISSION AT A BIT-RATE OF 2-048 Mb/s
M. G. Croll, D. W. Osborne, and D. F. Reid Dec. 1973 11 p refs
(BBC-RD-1973/42) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

A way in which six companded PCM. high quality sound channels could be multiplexed to form a bit rate of 2.048 Mb/s, including error protection and about 1 kb/s of signalling information, is described. The predicted performance of such a system is discussed and compared to that of the existing 13-channel multiplex system which employs linear coding. The proposed system uses a near-instantaneous digital companding technique that permits the number of bits in each audio sample word to be reduced from 13 to 10. Author

N74-15835# Japan Broadcasting Corp., Tokyo.
NEW METHOD OF COLOR TELEVISION CAMERA SYSTEM COMPOSITION, CCU-LESS COLOR TV CAMERA
Kotaro Wakui, Eiji Sawamura, and Hiroshi Marubayashi Aug. 1973 13 p
(NHK-169) Avail: NTIS HC $3.00

The composition, means of reducing the size and weight, and the remote control method of the CCU-less camera are outlined, along with the color viewfinder. Block diagrams are presented on the standard compact 3P color camera and the CCU-less color camera. The CCU-less color camera was developed as a new color camera system of higher mobility for expanding the range of camera pickup work. J.A.M.

N74-15836# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
AN EXAMINATION OF SPECTRUM ANALYSIS FOR THE PROCESSING OF LASER ANEMOMETER SIGNALS
J. O. Asalor Oct. 1973 44 p refs
(HTS/73/46) Avail: NTIS HC $4.25

To obtain correct quantitative values of rms, skewness, and flatness factors from spectrum analyzed laser anemometer signals, the ordinate of the recorded spectrum should be linear in the probability density function, P(f). This linear function is achieved by use of a suitable signal processing method. Four feasible methods were examined. The spectra from two of these are recorded from the spectrum analyzer output signal, the others are from the square of the output signal. The use of a deterministic signal helped to assess the results from each processing method. These show that the results obtained with the square of the analyzer output signal secured better agreement with those of the input deterministic signal. That the spectrum analyzer output signal should be squared is further suggested by the results of a theoretical analysis which, for an infinitely thin filter bandwidth, expresses the analyzer output signal as the square root of the probability density. Author

N74-15837# Swiss Inst. of Meteorology, Zurich.
LONG TERM VARIATION OF VLF SIGNALS OVER TRANS-AURORAL PATHS
Jean Rieker Mar. 1972 19 p refs Presented at VLF Symp., Sandefjord, Norway, 27-29 Oct. 1971 Submitted for publication
(Rept-32) Avail: NTIS HC $3.00

One year period synoptic representation of NPG and NPM field strength and relative phase are shown in a system of rectangular coordinates. Results are interpreted as far as possible in terms of interferences of mode conversion. Profiles of field strength along specific transition lines in the course of days show a quasi-semi-annual variation with maxima in summer and in winter and minima in spring and in autumn. Discussion is done from the point of view of computed sun zenith angles over the wave paths NPG, NPM-Payerne. Author

N74-15838*# National Aeronautics and Space Administration. Pasadena Office, Calif.
SIMULTANEOUS ACQUISITION OF TRACKING DATA FROM TWO STATIONS Patent Application
Gordon E. Wood, inventor (to NASA) Filed 15 Nov. 1973 24 p
(Contract NAS7-100)
(NASA-Case-NPO-13292-1; US-Patent-Appl-SN-416135) Avail: NTIS HC $3.25 CSCL 17B

A method and apparatus is disclosed for obtaining simultaneous tracking data from two ground stations relative to a spacecraft. In particular, the method is used for obtaining two-way range and doppler measurements with respect to the spacecraft using only one transponder on the spacecraft. The technique employs simultaneous transmission from two stations to produce a return signal with upper and lower sidebands resulting from the interference of the two transmissions. A transponder transmits the upper and lower sidebands centered about a carrier received by both stations. One station tracks the carrier and the other tracks a sideband aided by the carrier. NASA

N74-15839# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
SATELLITE DIFFRACTION LOSS MEASUREMENTS IN MOUNTAINEOUS TERRAIN
R. Menzel Dec. 1972 51 p refs Presented at the 13th Symp. on Tactical Satellite Commun., Oslo, 30 Aug. 1972
(Rept-10-72) Avail: NTIS HC $4.75

The parameters which affect communications in irregular terrain are discussed. A satellite communication terminal operating in an irregular terrain may be very strongly disturbed by diffraction losses if obstacles intervene the path from the ground terminal to the satellite. The diffraction losses are analyzed as functions of the scattering angle, polarization, obstacle shape, and angle of incidence. The two cases of: (1) diffraction by rounded obstacles with rough surfaces and (2) diffraction over multiple obstacles are analyzed. Author

N74-15840# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
SPEECH INTELLIGIBILITY WITH FREQUENCY-MODULATION COMMUNICATION SYSTEMS UNDER EXTREME FADING CONDITIONS
D. E. Marquart Dec. 1972 37 p refs Presented at the 13th Symp. on Tactical Satellite Commun., Oslo, 30 Aug. 1972
(Rept-9-72) Avail: NTIS HC $4.00

The influence of carrier fading on speech intelligibility with FM communication systems has been shown to be so heterogeneously sophisticated that a quantitative analysis seems to be of great importance for an optimum system design. Meaningful methods for increasing speech intelligibility with a given fading environment are those which reduce the probability of occurrence of periods of small carrier power i.e. of high FM noise power. Known methods are: antenna systems suppressing multipath propagation and diversity techniques. When the statistical behaviour of such reduced carrier fading is suited for mathematical description, the resultant intelligibility may be calculated. This condition is nearly always satisfied. It is thus possible to determine quantitatively the efficiency of methods in terms of an increase in articulation score. The information content and type of vocabulary to be used with a communication system is shown to be of great importance on system design. Author

N74-15841# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
SATELLITE-LINK FADING AT LOW ALTITUDES ABOVE IRREGULAR TERRAIN
J. Hortenbach Dec. 1972 36 p refs Presented at the 13th Symp. on Tactical Satellite Commun., Oslo, 30 Aug. 1972
(Rept-8-72) Avail: NTIS HC $4.00

The theory of scattering of electromagnetic waves by statistically rough surfaces is treated by two main approaches depending on the roughness scale of the scattering surface. The small roughness case (standard deviation of heights small compared to wavelength) is usually treated by perturbation techniques and will not be considered here. Scattering by large scale roughness is described by several optics approaches based on the Kirchhoff-integral. The surface radii of curvature are assumed to be large compared to wavelength so that the surface can be approximated at every point by a tangent plane which involves writing the scattered field at the surface as the product of the incident field and the proper reflection coefficient. This very rough surface model fits the conditions met in strong hilly regions at meter wavelengths and will be used here. Medium scale roughness models do not seem to be available; for practical applications the results of the above-mentioned theories may be extrapolated. Author

N74-15842# Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
ENGINEERING ASPECTS WITH SATELLITE COMMUNICATION TERMINALS IN AIRCRAFT
Kh. Rosenbach Dec. 1972 22 p refs Presented at the 13th Symp. on Tactical Satellite Commun., Oslo, 30 Aug. 1972
(Rept-7-72) Avail: NTIS HC $3.25

Design aspects of satellite communication terminals in aircraft and associated engineering considerations are discussed with respect to relatively stringent target specifications. The units developed and described as examples serve the main purpose of R and D measurements. On the other hand, they may well be considered basic prototypes of future airborne terminals. Author

N74-15843# Technische Univ., Berlin (West Germany). Fachbereichsrat des Fachbereichs Elektrotechnik.
CARRIER SYNCHRONIZATION IN ORTHOGONAL MODULATION AND MULTIPLE AMPLITUDE STEP-UP Ph.D. Thesis [TRAEGERSYNCHRONISATION BEI ORTHOGONALER MODULATION UND MEHRFACH-AMPLITUDENSTUFUNG]
Horst Spitzer 1972 113 p refs In GERMAN
Avail: NTIS HC $7.75

Frequency-and phase-correct carrier pull-in during coherent demodulation of stochastic series signals is obtained by phase filter cascades in bandwidth transmission systems with orthogonal modulation and multiple amplitude steps. The difference between effective values for the information signal and the carrier signal is between 15 db and 20 db. A combination phase filter cascade and adaptive impulse equalizer insures a correct phase with phaselock decoupling of 2 : 1 stationary sideband pilots. Transl. by G.G.

N74-15844# Joint Publications Research Service, Arlington, Va.
HYDROACOUSTIC TELEMETRY
Yu. F. Tarasyuk and G. N. Seravin 28 Jan. 1974 215 p refs Transl. into ENGLISH of the book "Gidroakusticheskaya Telemetriya" Leningrad, Sudostr., 1973 176 p
(JPRS-61084) Avail: NTIS HC $12.75

Hydroacoustic telemetry is described including the theory and practical application of technical devices for remote transmission of measurement data under water through a hydroacoustic communications channel. Author

N74-15845*# Axiomatix, Marina del Rey, Calif.
INTEGRATED SOURCE AND CHANNEL ENCODED DIGITAL COMMUNICATIONS SYSTEM DESIGN STUDY Final Report
Gaylord K. Huth 25 Jan. 1974 18 p refs
(Contract NAS9-13467)
(NASA-CR-134183; R7401-2) Avail: NTIS HC $3.00 CSCL 17B

Studies on the digital communication system for the direct communication links from ground to space shuttle and the links involving the Tracking and Data Relay Satellite (TDRS). Three main tasks were performed:(1) Channel encoding/decoding parameter optimization for forward and reverse TDRS links,(2) integration of command encoding/decoding and channel encoding/decoding; and (3) modulation coding interface study. The general communication environment is presented to provide the necessary background for the tasks and to provide an understanding of the implications of the results of the studies. Author

N74-15846*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK, VOLUME 19 Progress Report, Nov. - Dec. 1973

15 Feb. 1974 241 p refs
(Contract NAS7-100)
(NASA-CR-136730; JPL-TR-32-1526-Vol-19) Avail: NTIS HC $14.25 CSCL 17I

The progress is reported in the DSN for Nov. and Dec. 1973. Research is described for the following areas: functions and facilities, mission support for flight projects, tracking and ground-based navigation, spacecraft/ground communication, network control and operations technology, and deep space stations. F.O.S.

N74-15847# National Environmental Satellite Center, Washington, D.C.

DEPENDENCE OF ANTENNA TEMPERATURE ON THE POLARIZATION OF EMITTED RADIATION FOR A SCANNING MICROWAVE RADIOMETER

Norman C. Grody Jan. 1974 13 p refs
(NOAA-TR-NESS-68) Avail: SOD HC $0.50

The antenna temperature is determined for a scanning earth-viewing satellite-borne microwave radiometer. The result is in the form of an integral that includes the antenna gain function and brightness temperature. A composite emissivity term appears in the brightness temperature equation that contains the horizontal and vertical components of surface emissivity weighted by their respective antenna gains. Analysis is performed to obtain the antenna temperature components corresponding to the emission of horizontally and vertically polarized radiation. Author

N74-15848# Standard Telecommunication Labs., Ltd., Harlow (England).

A STUDY OF AN S-BAND TELEMETRY DIPLEXER IN EVANESCENT MODE WAVEGUIDE, PHASE 1 Final Report

C. K. Mok Paris ESRO Sep. 1973 178 p refs
(Contract ESTEC-1148/70)
(ESRO-CR-63) Avail: NTIS HC $11.00

A study of possible diplexers built in an evanescent mode waveguide is prescribed, and general evanescent-mode design theory is dealt with. Various filters, maximally flat and Tchebychev, incorporating different numbers of sections are considered. Various possible waveguide sizes and two different configurations of diplexer are also considered, with the primary objective of arriving at a design that is light in weight, of low loss and suitable for space applications. Recommendations for the optimum design, together with the expected performance are given. A computer printout of a 2-section maximally flat filter built in sq. WR90 - the recommended filter and waveguide size - is included. Author

N74-15849# Standard Telecommunication Labs., Ltd., Harlow (England).

A STUDY OF AN S-BAND TELEMETRY DIPLEXER IN EVANESCENT MODE WAVEGUIDE, PHASE 2 Final Report

C. K. Mok Paris ESRO Oct. 1973 34 p refs
(Contract ESTEC-1148/70)
(ESRO-CR-64) Avail: NTIS HC $3.75

A design theory for diplexers built in the evanescent mode waveguide is provided along with a description of the design and testing of the S-band telemetry diplexer. The design theory is relatively simple, extending the filter design theory to the design of diplexers. With this design the resulting diplexer is mechanically very simple, the whole assembly being built onto a single waveguide body. Many advantages of the evanescent mode medium were used to produce a lightweight (170 grams) and low loss (1.37 db per path) diplexer. The unit is also temperature compensated. Author (ESRO)

N74-15850# Compagnia Generale di Elettricita S.p.A., Milan (Italy). Div. Elettronica Professionale.

DESIGN, CONSTRUCTION AND TESTING OF AN S-BAND TELEMETRY TRANSMITTER

D. Chiesa, F. Mondini, and S. Callegaro Paris ESRO Sep. 1973 105 p
(Contract ESTEC-1214/70)
(ESRO-CR-99) Avail: NTIS HC $7.25

A description is given of the design, construction, and testing of a solid state S-band telemetry transmitter suitable for eventual use onboard a spacecraft. The transmitter, designed to operate in the range 2290 to 2300 MHz, has modular construction which may have either low power configuration with power output switchable between 0.7 and 1.5 W, or a high power configuration with power output switchable between 3.6 and 7.0 W. Configuration weight is 732 and 993 g respectively with a modulation baseboard up to 1 MHz. Operating efficiency is between 17.8 and 28% and operating temperature is from -20 to +50 C. Author (ESRO)

N74-15851# European Space Research Organization, Paris (France).

OPTIMIZATION OF THE NOISE IMMUNITY OF TRANSMISSION CHANNELS FOR ANALOG SIGNALS BY MEANS OF PREAMPLIFICATION

Alfred Becker (DFVLR, Brunswick) Nov. 1973 112 p refs Transl. into ENGLISH of Optimierung der Rauschbelastbarkeit von Uebertragungskanaelen fuer Analoge Signale durch Preempasis, DLR-FB-73-09, DFVLR, 1972
(ESRO-TT-3; DLR-FB-73-09) Avail: NTIS HC $7.75

The preemphasis of a signal using a linear filter is a powerful method of improving the immunity of the signal quality against the noise of the subsequent transmission channel. On the assumption of known signal and noise power spectra the frequency response of the optimum preemphasis filter is derived. The quality measure is defined in terms of powers. Plots of the optimized values of signal power, channel cutoff frequency, and gain are given. The assumed signal model consists of Gaussian distribution and approximated Butterworth spectrum in connection with an amplitude and frequency limited AM or FM channel. The calculated gain is in the order of 8 db to 45 db. Author

N74-15852# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.

A STATE OF THE ART PULSE AMPLITUDE DECOMMUTATOR DESIGN

Terry M. Lamb 31 Jul. 1973 22 p refs
(AF Proj. 7659)
(AD-768668; AFCRL-TR-73-0478; AFCRL-IP-200) Avail: NTIS CSCL 09/6

The instrumentation report describes the design and application of a Pulse Amplitude Decommutator designed and built by the author. The unit has been successfully used for flight evaluation of telemetry at the Air Development Test Center (A.D.T.C.), Eglin AFB, Florida as part of the HAVE GENIE two (Oct. 72) and at the Barrera do Inferno Research Range, Natal, Brazil, as part of the MARKOV EFFECT (MKV-1) program. The paper also presents basic material on the theory and application of Pulse Amplitude Telemetry systems. Author (GRA)

N74-15853# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

PRECISION RADAR POINTING AND TRACKING USING AN ADAPTIVE KALMAN FILTER M.S. Thesis

Raymond Lee Kolibaba Jun. 1973 99 p refs
(AD-768378; GGC/EE/73-9) Avail: NTIS CSCL 17/9

An Adaptive Extended Kalman Filter technique was developed to improve the tracking capabilities of an airborne tracking system. A maneuver determination technique was developed as well as an adaptive technique for the probability model of target acceleration. The computer simulation was run using four different types of data. Computation of the acceleration state was inaccurate due to imprecise modeling of the acceleration states. The adaptive technique reduced the range error of the non-adaptive filter. A maneuver was determined when a bias was detected on the range measurement residual. Author (GRA)

N74-15854# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.

MECHANICAL INFERENCE PROBLEMS IN CONTINUOUS SPEECH UNDERSTANDING

W. A. Woods and J. Makoul Aug. 1973 38 p refs Presented at 1973 Intern. Joint Conf. on Artificial Intelligence
(Contract DAHC15-71-C-0088)
(AD-767397; BBN-2565; AI-5) Avail: NTIS CSCL 17/2

The report describes the types of probabilistic, plausible inferences that a continuous speech understanding system will

have to be capable of making in order to extract meaning out of the speech signals that human beings produce. Author (GRA)

N74-15855# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
NONLINEAR VIBRATION OF MOVING STRIPS
P. D. Dotsenko 19 Sep. 1973 15 p refs Transl. into ENGLISH from Samoletostr. Tekh. Vozoush. Flota (USSR), no. 25, 1971 p 123-126
(AD-767883; FTD-HT-23-191-74) Avail: NTIS CSCL 14/3

A strong relationship between the rate of longitudinal motion and the frequency, vibration amplitude and boundary of the instability region is observed when designing tape transports, and when considering natural, forced and parametric vibrations. A feature of this problem is the presence of nonlinear kinematic damping, which considerably affects the behavior of the amplitude and frequency of the vibrations. GRA

N74-15856# Stanford Univ., Calif. Electronics Lab.
NOISE SUBTRACTING FILTER STUDY Final Report, 28 Jan. 1971 - 27 Jan. 1972
John Kaunitz and Bernard Widrow 3 Oct. 1973 180 p refs
(Contract N00024-71-C-1189)
(AD-767717; SU-SEL-72-038; SU-TR-6798-1) Avail: NTIS CSCL 09/4

A new approach is presented to the problem of suppressing broadband additive interference corrupting a received signal. The noise cancelling procedure developed for the suppression of such interference is intended for problem situations where a second independent input related to the interfering process but not to the signal itself can be easily obtained. This input is called the reference and is used, after suitable filtering, to cancel the interference in the main or primary input. This filtering process is adaptive and is based on the Least Mean Square algorithm of Widrow and Hoff. The algorithm is applied here so as to minimize the output power of the system on the basis of measurements at the system terminals. The adaptive algorithm requires no a priori knowledge about the properties of the system inputs, but a certain amount of qualitative a priori knowledge is required for the proper design of the built in system parameters. In as much as the required signal itself is not filtered, it remains undistorted by the noise cancelling process. Some aspects of the implementation and practical application of adaptive filters are briefly discussed. The successful application of the noise cancelling concept, using a real-time hybrid adaptive signal processor, in two distinctly different practical situations is described. (Modified author abstract) GRA

N74-15857# Develco, Inc., Mountain View, Calif.
THE FEASIBILITY OF A SUB-LF SATELLITE-TO-SUBMARINE COMMUNICATION DOWNLINK VLF NOISE LEVELS IN THE IONOSPHERE Technical Report, 13 Dec. 1971 - 27 Nov. 1972
Nicholas Dunckel 27 Nov. 1972 15 p refs
(Contract N00014-72-C-0113)
(AD-769139; Rept-532-721127; TR-2) Avail: NTIS CSCL 17/2

The electromagnetic noise environment of satellite-borne ELF, VLF and LF receivers was investigated. Noise data obtained from a number of satellite and rocket experiments (maximum altitude 3000 km) have been reviewed and summarized. The intensity of whistlers, equatorial hiss, and man-made signals as a function of latitude, time of day and state of the ionosphere were examined and typical noise environment curves were presented. These data suggest that areas near the magnetic equator and over the polar cap provide the lowest ionospheric noise environment. Author (GRA)

N74-15858# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MULTIPLE-TWO-HYPOTHESIS TESTING: A NEW METHOD FOR DETERMINING SIGNAL CONTENT M.S. Thesis
John A. Nowacki Sep. 1973 122 p refs
(AD-769497; GE/EE/73S-9) Avail: NTIS CSCL 09/4

Detecting and classifying overlapping waveforms can be done using M-ary hypothesis testing. A new detection method, multiple-two-hypothesis testing, is developed by minimizing the probability of error for each decision made, and is shown to have computational advantages over M-ary hypothesis testing. A sequential test is developed from multiple-two-hypothesis testing, and it is also shown to have computational advantages over M-ary hypothesis testing. The three detection methods are applied to the synchronous detection of two signals with no overlap, and their performances are compared. Then M-ary hypothesis testing and multiple-two-hypothesis testing are applied to the synchronous detection of two signals with one overlap and error equations are presented for the two methods. Finally, multiple-two-hypothesis testing is combined with maximum a posteriori estimation to solve nonsynchronous detection problems. Author (GRA)

N74-15859# Texas Univ., Austin. Applied Research Labs.
MULTIPLEXER-DEMULTIPLEXER SYSTEM
Wiley S. Olsen 30 Aug. 1973 33 p
(Contract N60921-73-C-0107; Proj. CAPTOR)
(AD-768862; ARL-TM-73-27) Avail: NTIS CSCL 17/2

The multiplexer-demultiplexer system was designed to allow six different signals to be recorded on a single channel of a magnetic tape recorder and to be recovered in their original form upon playback. The system is composed of two basic units: the multiplexer and the demultiplexer. The multiplexer is described first to show what signals are recorded and how the unit operates. The description of the demultiplexer unit follows with a description of the means by which the signal are separated. Schematic diagrams are included for each of the units. Author (GRA)

N74-15860# Technology Service Corp., Santa Monica, Calif.
SIMULATION OF HIGH-RESOLUTION RADAR DISPLAYS OF CITY COMPLEXES
Richard L. Mitchell, A. B. Lucero, and R. E. Harrison Brooks AFB, Tex. AFHRL Aug. 1973 116 p refs
(Contract F33615-72-C-1583; AF Proj. 6114)
(AD-768413; AFHRL-TR-73-11) Avail: NTIS CSCL 17/9

The modeling and simulation techniques capable of generating large-scale high-resolution radar displays of cultural features are investigated. Specific features include power transmission towers, buildings, railroads, bridges, storage tanks, streets, rivers, and natural terrain. In addition, the general background-type of return is also discussed. The problem of real-time simulation is assessed. The techniques have been applied to simulate radar images of a 2.25 x 2.25 mile area of North Long Beach, California, to a resolution of 20 feet. Author (GRA)

N74-15861# Denver Research Inst., Colo.
SYSTEM RESPONSE AND PROPAGATION STUDIES Final Technical Report, 1 Nov. 1971 - 31 Dec. 1972
Ross W. Buchanan 15 Dec. 1972 36 p
(Contract F33657-72-C-0331; ARPA Order 1371)
(AD-756645; DRI-2613) Avail: NTIS CSCL 20/14

The report deals with the use of the Denver Research Institute Pulsed Antenna System. The pulser was operated to provide a service to the community at Kirtland AFB, New Mexico and Honolulu, Hawaii (Los Alamos Scientific Laboratory). The use of the pulser as a source for an over the horizon experiment with receivers at Bangor, Maine is described. A technique for generation of narrow band signals using a directional antenna was developed as well as a technique for generation of two time-tied pulses form a single antenna system. Author (GRA)

N74-15862# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
IMPROVED SPECTRUM ANALYSIS NOISE RADAR SYSTEMS
F. Sheppard Holt, John N. Pierce, and John K. Schindler 30 Apr. 1973 66 p refs
(AF Proj. 5635)
(AD-768694; AFCRL-TR-73-0279; AFCRL-PSRP-547) Avail: NTIS CSCL 17/9

Basic cross-correlation and spectrum analysis type noise radars are defined and analyzed. Inherent undesirable characteristics of the basic spectrum analysis type radar are discussed. A modification of the spectrum analysis radar that removes most of these undesirable characteristics is described and evaluated. A new spectrum analysis system designed to detect moving targets is presented. Comparison is made of the detection

capabilities of all four noise radar systems in the presence of extraneous noise. Author (GRA)

N74-15863# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
CONSTRAINED MINIMAX BEAMFORMING FOR LINE ARRAYS
Donald W. Tufts and Ronald A. Mucci 25 Aug. 1973 40 p refs
(Contract N00014-68-A-0215-0006)
(AD-768873; URI-EE-4044/4) Avail: NTIS CSCL 09/5

An algorithm, primarily intended for design of finite impulse response (FIR) digital filters possessing equiripple characteristics, is used for design of linear antenna arrays. This algorithm provides the capability of imposing upper and lower constraining functions on the beam pattern or response of the antenna array. Expressions are derived, relating parameters of the response of the antenna array to the parameters of the design algorithm. Interpretations of the effects of varying certain parameters of the array, including the effects of conventional beam steering, are presented by means of examples. Author (GRA)

N74-15864# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
NOISE-REDUCING, NONRECURSIVE DIGITAL FILTERS
Donald W. Tufts, James T. Lewis, and Ronald A. Mucci 25 Sep. 1973 45 p refs
(Contract N00014-68-A-0215-0006)
(AD-768874; URI-EE-4044/5) Avail: NTIS CSCL 09/5

Techniques for the design of noise-reducing, nonrecursive digital filters are compared. Special emphasis is placed on a simple method for constraining the response of a filter at selected frequencies, including the edges of the passband, while minimizing the filter output noise power over a specified stopband of frequencies. These constraints can be used to shape the passband response, for example. The above mentioned constrained-points (CP) method is compared with three other of digital filter design which are based on the criteria of maximum energy-ratio or maximum SNR, minimax error subject to upper and lower restraining functions and least-squares approximation. The special problem of rejecting strong sinusoidal interferences without excessive change in passband response or putput noise power is shown to be well suited to the CP method of design.
Author (GRA)

N74-15865# Army Missile Command, Redstone Arsenal, Ala.
ANALOG-TO-DIGITAL CONVERTER TECHNOLOGY PRELIMINARY INVESTIGATION AND PROPOSAL
James F. Lancaster, Donald W. Burlage, and Robert H. Fletcher 7 Aug. 1973 31 p refs
(DA Proj. 1M2-62303-A-214)
(AD-768771; RE-TR-73-25) Avail: NTIS CSCL 17/9

A brief introduction to analog-to-digital converters is presented, which includes both basic characteristics as well as typical error sources. Some more common types of converters are described and current state-of-the-art in this area is indicated. Various performance evaluation techniques are illustrated, and a proposed program for performing in-house analog-to-digital converter evaluations is outlined. Author (GRA)

N74-15866# TRW Systems Group, Redondo Beach, Calif. Space Vehicles Div.
FEASIBILITY DEMONSTRATION OF LOW FREQUENCY ACOUSTO-OPTICAL IMAGING FOR SONAR APPLICATIONS Interim Report, Jan. 1972 - Jun. 1973
R. A. Smith, J. H. Cole, R. L. Johnson, and P. G. Bhuta 12 Jul. 1973 108 p refs
(Contract N00014-72-C-0182; ARPA Order 1959; NR Proj. 230-030)
(AD-768398; TRW-AT-SVD-TR-73-10) Avail: NTIS CSCL 17/1

Analysis and experiments were performed to prove the feasibility of an underwater imaging system based on acousto-optical imaging for sonar applications at frequencies from 25 to a few hundred KHz. Experimental results confirming sensitivity and resolution are presented together with images of insonified objects at a distance of 15 feet (the maximum allowed by the size of the test facility). A novel heterodyning technique was devised to perform low frequency imaging. Based upon the laboratory experiments, range and resolution achievable with the acousto-optical imaging sonar are estimated. Construction of a high resolution acousto-optical imaging sonar is entirely feasible. Author (GRA)

N74-15867# Philco-Ford Corp., Willow Grove, Pa. Communication Systems Div.
CIRCUIT QUALITY MONITOR Final Report, 28 May 1971 - 23 Jul. 1973
William Foerster and Donald R. Pandori Aug. 1973 48 p refs
(Contract DAAB07-71-C-0271)
(AD-768899; ECOM-0271-3) Avail: NTIS CSCL 17/2

The objective of the program was to establish the feasibility of automatically classifying high usage links as to their relative suitability. Author (GRA)

N74-15868# Naval Postgraduate School, Monterey, Calif. Dept. of Electrical Engineering.
AN ARBITRARILY BENT MONOPOLE ANTENNA ABOVE A PERFECT INFINITE GROUND M.S. Thesis
Eugene Garland Neely, III Sep. 1973 65 p refs
(AD-769392) Avail: NTIS CSCL 09/5

Hallen type integral equations are formulated for an arbitrarily bent monopole above an infinite perfect ground plane and, by numerical solution techniques, current distributions are obtained. The coupled integral equations are founded upon the familiar electric scalar potential and magnetic vector potential. Numerical results are presented for several cases including different bent angles and are compared where possible with available data.
Author (GRA)

N74-15869# Naval Postgraduate School, Monterey, Calif. Dept. of Electronics Engineering.
A SPREAD SPECTRUM COMMUNICATION TECHNIQUES M.S. Thesis
James Alfred Cocci Sep. 1973 89 p refs
(AD-769416) Avail: NTIS CSCL 17/2

A practical solution to the problem of realizing a signal processing method for a covert voice communications system was the objective of the thesis. Spread spectrum technology in the form of Golay complementary sequences implemented with acoustic surface wave devices was used to achieve this processing. The resultant device was an audio transceiver MODEM in which a specially coded form of pulse code modulation (PCM) was applied to a voice signal to enable application of the spread spectrum concept. The technique exploited spread the 3 KHz voice modulation over a one MHz bandwidth. A method of PCM synchronization evolved which achieves system send/receive synchronization with a minimum of data loss and a minimum amount of actual hardware. (Modified author abstract) GRA

N74-15870# Naval Postgraduate School, Monterey, Calif.
SELECTIVE CALLING DEVICE FOR THE MOBILE MARITIME SERVICE M.S. Thesis
Vernon Christopher Hipkiss Sep. 1973 43 p refs
(AD-769434) Avail: NTIS CSCL 17/2

INTEL's MCS-4 micro computer set was selected to implement a digital selective calling device for use by the mobile maritime service. The system will generate and receive a standardized calling message. Upon receipt of a valid calling message, intended for the user, the system will activate visual and audible alarms.
Author (GRA)

N74-15871# Naval Research Lab., Washington, D.C.
AN EMPIRICAL SEA CLUTTER MODEL Interim Report
John Daley Oct. 1973 37 p refs
(NRL Proj. R07-02)
(AD-769666; NRL-MR-2668) Avail: NTIS CSCL 17/9

The extensive sea return data bank acquired with the NRL four-frequency radar system has been used to develop an empirical model for the median value of the normalized radar cross section (sigma sub/) of the sea. This model encompasses a wide range of radar and surface parameters in the microwave region for depression angles from near grazing to vertical incidence. Wind velocity is used as the basic descriptor of the ocean surface, and a power law dependence to (sigma sub/) is found to be

applicable to most sea conditions. Comparisons of the model with theory show agreement with both the composite surface theory at moderate depression angles and with the specular point theory at vertical incidence. Author (GRA)

N74-15872# Naval Postgraduate School, Monterey, Calif.
A CORRELATION POLARIMETER FOR DEEP SPACE TRACKING
Wolff-Ruediger Zimmermann Sep. 1973 193 p refs
(AD-769442) Avail: NTIS CSCL 09/5

The tracking polarimeter implemented on the 64-meter National Aeronautics and Space Administration/Jet Propulsion Laboratory (NASA/JPL) parabolic antenna at Goldstone, California uses a pair of waveguide quarter-wave plates to allow synthesis of a rotating cross-polarized linear feed system, and a phase-locked-loop (PLL) to coherently determine an error signal from the signal component in the error channel. This error signal drives the feed system until the error axis is orthogonal to the signal axis. Because the PLL has the normal loss of lock problem at low signal-to-noise ratios a correlation polarimeter has been developed. The PLL is replaced by a multiplier as a correlator. The correlation between the signal components in the reference and error channels accomplishes a detection of the error signal because both have same phase, since they are just different projections of the same signal vector.. The analysis, the investigation of the theory by means of a working model, the development of the actual correlation polarimeter and the test series performed are described. Author (GRA)

N74-15873# Lehigh Univ., Bethlehem, Pa. Center for the Application of Mathematics.
NON-LINEAR ELECTROMAGNETIC WAVE PROPAGATION IN AN ISOTROPIC MATERIAL
Eric P. Salathe and P. A. Blythe Aug. 1973 32 p refs
(Contract DAAD05-69-C-0053)
(AD-769632; CAM-110-28; BRL-CR-114) Avail: NTIS CSCL 20/14

It is shown that small departures from the classical linear constitutive relations can have significant cumulative effects on the propagation of electromagnetic waves. A non-linear far field theory is developed for holohedral isotropic materials. It is found that the amplitude of the signal propagates independently of the direction, although the local direction field depends strongly on this amplitude. The evolution of weak electromagnetic shocks is also discussed. Author (GRA)

N74-15874# United Aircraft Corp., East Hartford, Conn.
MASTER OSCILLATOR TECHNIQUES FOR 10 MICRON RADAR Semiannual Technical Report, 25 Mar. - 30 Sep. 1973
A. Stein 30 Sep. 1973 39 p refs
(Contract N00014-73-C-0086; ARPA Order 1806)
(AD-769778; M921512-5) Avail: NTIS CSCL 20/5

A CO2 waveguide laser was coupling-modulated with the help of an intra-activity electro-optic polarization switch. Linear FM-modulation was achieved by sweeping the drive frequency from 100 to 500 MHz in linear fashion. The optical beam coupled from the resonator represented a suppressed-carrier-double-sideband-modulated. signal. The sidebands are chirped in opposite spectral directions as the modulation is swept through the chirp range. By placing the optical carrier in the wing of the P(20) gain profile, only one sideband chirps through the range of interest, the other falls outside the gain profile. This experiment represents a further important step towards the contract goal to obtain fast linear FM-modulation centered on the P(20) line profile. A second important result obtained during the reporting period is the design, construction and testing of a sealed-off CO2 waveguide laser which is to yield the required frequency stability. GRA

N74-15875# Naval Postgraduate School, Monterey, Calif.
THE FAR FIELD ANALYSIS OF PARALLEL PLATE LUNEBERG LENSES FOR VARIOUS FIELDS M.S. Thesis
Robert Boyd Birchfield Sep. 1973 74 p refs
(AD-769439) Avail: NTIS CSCL 09/5

The thesis developed expressions for the aperature fields and integral equations for the far field radiation characteristics of the Parallel Plate Luneberg Lens Microwave Antenna operating in the TEM or TE sub (10) modes. These expressions were programmed on a digital computer to predict the far field radiation patterns for several feed systems. Experimentation produced far field radiation patterns that were very close to the theoretical patterns for the TE sub 10 mode lens and substantially different for the TEM mode lens. Author (GRA)

N74-15876# Lincoln Lab., Mass. Inst. of Tech., Lexington.
THE EFFECTS OF INTERFERENCE ON MONOPULSE PERFORMANCE
R. J. McAulya 1 Aug. 1973 35 p refs
(Contract DOT-FA72WAI-261)
(AD-769336; TN-1973-30; ESD-TR-73-176) Avail: NTIS CSCL 17/9

The first and second moments of the monopulse azimuth estimates are used to characterize the estimator performance in a background of mainbeam or side-lobe multipath or ATCRBS interference. An exact expression for the bias error is obtained that not only accounts for the bias due to targets separated in azimuth but also demonstrates the effect of fading or signal cancellation. For a target signal at a 20 db signal-to-noise ratio, it is shown that the fading effect produces negligible bias unless the signal-to-interference ratio is between plus or minus 2.5 db. A first order expression for the variance is obtained that demonstrates that an increase in the random error will occur due to the target separation in azimuth and due to signal fades. The exact nature of the bias and variance depend strongly on the relative phase between the target and interference signals with the poorest performance being obtained at the in- and out-of-phase conditions. It is knowledge of this behaviour that is essential in evaluating the idea of azimuth estimation data editing. Author (GRA)

N74-15877# Naval Postgraduate School, Monterey, Calif.
THE GLOBAL RESCUE ALARM NET (GRAN): A SYSTEM ANALYSIS
Michael Edwin Langley Sep. 1973 102 p refs
(AD-769441) Avail: NTIS CSCL 17/2

The Global Rescue Alarm Net (GRAN) is a proposed Search and Rescue (SAR) system. The purpose of the system is to provide real-time world-wide distress alarm, identification, and position information for the isolated distress case. In the GRAN system a link consists of a handheld Search and Rescue Communicator (SARCOM) unit, a geosynchronous Search and Rescue Satellite (SARSAT) relay, and a processing station, the Search and Rescue Central (SARCEN). This thesis is a system analysis of the proposed GRAN system to generate the broad system requirements. To provide global coverage the numbers and locations of SARSATs and SARCENs are determined. Based on SAR statistical data, SARCOM distribution, multiple access, and probability of interfering transmissions are examined. The SARSAT characteristics such as configuration, antenna gains, and power output are considered in relation to the overall system. From experimental and theoretical data, reference values are chosen which are representative of near-worst case from which the total link can be characterized. From this characterization, system parameters such as SARCEN G/T and SARSAT transmit power can be determined. Author (GRA)

N74-15878# Naval Electronics Lab. Center, San Diego, Calif.
INCOHERENT OPTICAL CORRELATOR FOR ACTIVE SONAR Research and Development Report, 1 Nov. 1971 - 1 Jul. 1973
T. C. Strand and C. E. Persons Jul. 1973 61 p refs
(ZF61112001)
(AD-769683; NELC-TR-1887) Avail: NTIS CSCL 17/1

The important design parameters for an incoherent optical correlator as applied to the active sonar problem are developed and discussed. An incoherent optical correlator assembly is presented which is capable of simultaneously correlating each of six different inputs with 150 different reference functions in real time. The results of system tests using a linear frequency-modulated input signal having a time-bandwidth product of 100 are reported. (The correlator is found to have a measured processing gain of 10 db, which is in agreement with theoretical predictions.) The performance of a liquid-crystal device used as a real-time, updatable mask is found to equal that of photographic film. Author (GRA)

N74-15879# Army Electronics Command, Fort Monmouth, N.J.
THE POTENTIAL USE OF TACTICAL MICROWAVE RADIO (TMR) FOR TRANSMISSION OF WEATHER RADAR DATA
Casimir J. Matonis Dec. 1973 37 p refs
(DA Proj. 1T0-62111-A-126)
(AD-769741; ECOM-5524) Avail: NTIS CSCL 17/2

The report covers transmission of weather radar data by a Tactical Microwave Radio (TMR). The transmission of wideband analog data between a weather radar, such as AN/TPS-41, and a remote unit 32 km away are examined, with the emphasis on cost, simplicity, and the use of available militarized equipment. Additional data relevant to radar remoting are included in the Appendices. A 32 km line-of-sight link is calculated for Air Force-developed TMR equipment. Video bandwidth, antenna size, and transmitted power are varied to arrive at an optimum system. The TMR is suitable for remoting AN/TPS-41 weather radar data to 32 km, with 3 ft dish antennas mounted on 15 m masts. The reliability is 99.94%, or a maximum data loss of 26 minutes during the worst month. Data loss can be reduced to 13 minutes by reducing the video bandwidth to 2 MHz and employing selective filtering. Author (GRA)

N74-15880# Harry Diamond Labs., Washington, D.C.
TRANSIENT MICROWAVE INSERTION LOSS TESTS IN AN ARC-HEATED WIND TUNNEL
Guy J. Hutchins and Robert F. Sullivan Jul. 1973 41 p refs
(DA Proj. 1X2-64307-D-212)
(AD-769588; HDL-TR-1633) Avail: NTIS CSCL 09/5

The need for a low-cost antenna window that can withstand moderate aerodynamic heating conditions led to an investigation of several candidate materials. Transient insertion loss measurements were obtained during the application of a thermal environment in an arc-heated wind tunnel at the NASA/Langley Thermal Facility. The primary purpose of these tests was to compare the performance of candidate window materials in the presence of different ablating heatshield materials.
Author (GRA)

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N74-15881# National Bureau of Standards, Washington, D.C. Systems Development Div.
REVIEW OF NETWORK MANAGEMENT PROBLEMS AND ISSUES Interim Report
A. J. Neumann Oct. 1973 79 p refs
(Grant NSF AG-350)
(NBS-TN-795) Avail: SOD HC $1.00 as C13.46:795

The activities involved in computer networking are discussed to show the scope of the work. The various functions are defined as: (1) creation of network products, (2) distribution processes, (3) user activities, and (4) supporting services. The networking function also includes all management performed at computing centers, documentation facilities, and service distribution centers. Organizational alternatives are conceived in terms of a four layer organization model. Conclusions deal with continuing problem areas, the need for a structural model for network management, critical experiments and tasks to be underaken to further networking capabilities, and a suggestion to establish planning teams to initiate steps required for further networking development. Author

N74-15882# National Bureau of Standards, Washington, D.C. Inst. for Computer Sciences and Technology.
A STUDY OF SIX UNIVERSITY-BASED INFORMATION SYSTEMS
Beatrice Marron, Elizabeth Fong, Dennis W. Fife, and Kirk Rankin Jun. 1973 100 p Sponsored by NSF
(NBS-TN-781) Avail: SOD HC $1.25 Domestic Postpaid or $1.00 GPO Bookstore as C13.46:781

A methodology for categorically describing computer-based information systems was developed and applied to six university-based, NSF-supported, systems. The systems under study all operate as retail information centers primarily serving campus communities by accessing large commercially-available data bases using 3rd generation computer configurations. The systems vary in design philosophy, mode of user service, transferability characteristics, and operational status. A summary matrix is included. Author

N74-15883# National Bureau of Standards, Washington, D.C. Office of Standard Reference Data.
SETAB: AN EDIT/INSERT PROGRAM FOR AUTOMATIC TYPESETTING OF SPECTROSCOPIC AND OTHER COMPUTERIZED TABLES
Robert C. Thompson and Joseph Hilsenrath Dec. 1973 29 p refs
(NBS-TN-740) Avail: SOD HC $0.55 as C13.46:740

A FORTRAN program SETAB, which accepts a card deck or Fortran records on magnetic tape and inserts the appropriate flags and shift symbols required by many programs associated with phototypesetting devices is reported. The program is specialized to the particular application, the phototypesetter and typography programs, and to the desired typefaces by means of parameter cards supplied at run time. Examples are shown of spectroscopic tables typeset on the Linofilm phototypesetter at the Government Printing Office using the Autoset Typography Program. The program was also used for tables of other types of data. The program can handle any records which can be read by a FORTRAN READ statement under A format control. The original record can be divided into as many as 40 fields and these fields can be combined in any order with any of 26 strings in front of or between the pieces. The program will, on a signal, replace a field by another field or by a combination of fields and strings. The output lines are blocked and paged via the insertion of the required strings between blocks and pages.
Author

N74-15884# RAND Corp., Santa Monica, Calif.
REAL-WORLD EXPERIMENTATION COMPARING TIME-SHARING AND BATCH PROCESSING IN TEACHING COMPUTER SCIENCE
H. Sackman Oct. 1973 24 p refs
(P-5106) Avail: NTIS HC $3.25

A large scale experiment was made to test the effectiveness of time sharing and batch processing in teaching computer science. The experimental design was centered on direct, real world comparison of student effectiveness with time sharing and batch processing systems using the same computer (the Burroughs B-5500) and the same programing language (ALGOL). The experimental sample involved all introductory computer science courses with a total population of 415 cadets. Participating classes were assigned to matched groups based on overall student grades, course, and instructor. Performance was measured in relation to 12 standardized class problems. The performance measures included man hours nad elapsed time to solve problems, computer runs, problem grades, pretest and posttest student attitudes, and other variables collected automatically and by questionnaire. The results generally indicated a mixed pattern of advantages and disadvantages for both modes, with no generalized clearcut superiority emerging for either one. Author

N74-15885# RAND Corp., Santa Monica, Calif.
A GUIDE TO DISPLAY TERMINALS THAT ENHANCE MAN/COMPUTER COMMUNICATIONS
Gabriel F. Groner Jan. 1973 49 p refs
(R-1183) Avail: NTIS HC $4.50

A general summary is given of experience gained by several companies on current achievable needs and expectations of display terminals. State of the art display terminal technologies are described and a sampling of commercial terminals is given.
Author

N74-15886# RAND Corp., Santa Monica, Calif.
MINICOMPUTERS: A REVIEW OF CURRENT TECHNOLOGY, SYSTEMS, AND APPLICATIONS
Dennis Hollingworth Jul. 1973 103 p refs
(R-1279) Avail: NTIS HC $7.25

The more significant characteristics found in today's minicomputers are discussed and leading manufacturers' products that

are most representative of their product lines are reviewed. Each system is considered in terms of processor, memory, and input/output system characteristics, as well as peripheral and software support. Emphasis is placed on the functional capabilities of minicomputers as they relate to the user, rather than on circuit design or processor logic. Further, the discussion is slanted toward the requirements of the end-user and how the manufacturer has addressed those requirements. Author

N74-15887*# International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
GROUND OPERATIONS AEROSPACE LANGUAGE (GOAL). VOLUME 1: STUDY OVERVIEW Final Report
31 Jul. 1973 31 p
(Contract NAS10-6900)
(NASA-CR-136781) Avail: NTIS HC $3.75 CSCL 09B

A series of NASA and Contractor studies sponsored by NASA/KSC resulted in a specification for the Ground Operations Aerospace Language (GOAL). The Cape Kennedy Facility of the IBM Corporation was given the responsibility, under existing contracts, to perform an analysis of the Language Specification, to design and develop a GOAL Compiler, to provide a specification for a data bank, to design and develop an interpretive code translator, and to perform associated application studies. Author

N74-15888*# International Business Machines Corp., Gaithersburg, Md.
GROUND OPERATIONS AEROSPACE LANGUAGE (GOAL). VOLUME 2: COMPILER Final Report
31 Jul. 1973 265 p
(Contract NAS10-6900)
(NASA-CR-136780) Avail: NTIS HC $15.25 CSCL 09B

The principal elements and functions of the Ground Operations Aerospace Language (GOAL) compiler are presented. The technique used to transcribe the syntax diagrams into machine processable format for use by the parsing routines is described. An explanation of the parsing technique used to process GOAL source statements is included. The compiler diagnostics and the output reports generated during a GOAL compilation are explained. A description of the GOAL program package is provided.
Author

N74-15889*# International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
GROUND OPERATIONS AEROSPACE LANGUAGE (GOAL). VOLUME 3: DATA BANK Final Report
31 Jul. 1973 139 p
(Contract NAS10-6900)
(NASA-CR-136779) Avail: NTIS HC $9.00 CSCL 09B

The GOAL (Ground Operations Aerospace Language) test programming language was developed for use in ground checkout operations in a space vehicle launch environment. To insure compatibility with a maximum number of applications, a systematic and error-free method of referencing command/response (analog and digital) hardware measurements is a principle feature of the language. Central to the concept of requiring the test language to be independent of launch complex equipment and terminology is that of addressing measurements via symbolic names that have meaning directly in the hardware units being tested. To form the link from test program through test system interfaces to the units being tested the concept of a data bank has been introduced. The data bank is actually a large cross-reference table that provides pertinent hardware data such as interface unit addresses, data bus routings, or any other system values required to locate and access measurements. Author

N74-15890*# International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
GROUND OPERATIONS AEROSPACE LANGUAGE (GOAL). VOLUME 4: INTERPRETIVE CODE TRANSLATOR Final Report
31 Jul. 1973 149 p
(Contract NAS10-6900)
(NASA-CR-136778) Avail: NTIS HC $9.50 CSCL 09B

This specification identifies and describes the principal functions and elements of the Interpretive Code Translator which has been developed for use with the GOAL Compiler. This translator enables the user to convert a compliled GOAL program to a highly general binary format which is designed to enable interpretive execution. The translator program provides user controls which are designed to enable the selection of various output types and formats. These controls provide a means for accommodating many of the implementation options which are discussed in the Interpretive Code Guideline document. The technical design approach is given. The relationship between the translator and the GOAL compiler is explained and the principal functions performed by the Translator are described. Specific constraints regarding the use of the Translator are discussed. The control options are described. These options enable the user to select outputs to be generated by the translator and to control vrious aspects of the translation processing. Author

N74-15891*# International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
GROUND OPERATIONS AEROSPACE LANGUAGE (GOAL). VOLUME 5: APPLICATION STUDIES Final Report
31 Jul. 1973 76 p
(Contract NAS10-6900)
(NASA-CR-136777) Avail: NTIS HC $6.00 CSCL 09B

The Ground Operations Aerospace Language (GOAL) was designed to be used by test oriented personnel to write procedures which would be executed in a test environment. A series of discussions between NASA LV-CAP personnel and IBM resulted in some peripheral tasks which would aid in evaluating the applicability of the language in this environment, and provide enhancement for future applications. The results of these tasks are contained within this volume. The GOAL vocabulary provides a high degree of readability and retainability. To achieve these benefits, however, the procedure writer utilizes words and phrases of considerable length. Brief form study was undertaken to determine a means of relieving this burden. The study resulted in a version of GOAL which enables the writer to develop a dialect suitable to his needs and satisfy the syntax equations. The output of the compiler would continue to provide readability by printing out the standard GOAL language. This task is described. Author

N74-15892# Engins Matra, Velizy (France).
STUDY ON AN ERAF DATA PREPROCESSING FACILITY. VOLUME 1: INTRODUCTION AND REVIEW OF PREPROCESSING METHODS
G. E. Lowitz and J. C. Guillen Jul. 1973 114 p refs
(Contract ESTEC-1762/72-PP)
(ESRO-CR(P)-300) Avail: NTIS HC $7.75

The scope and objectives of the earth resources aircraft facility study are reviewed and the major requirements discussed. The sensors to be used are considered and the general study methodology outlined. Data processing requirements and methods are described and possible pre-processing operations, e.g. data acquisition and correction, are discussed. Format conversion is considered and display requirements and data indexing and retrieval are noted. ESRO

N74-15893# Engins Matra, Velizy (France).
STUDY OF AN ERAF DATA PREPROCESSING FACILITY. VOLUME 2: ERAF DATA FLOW
G. E. Lowitz and J. C. Guillen Jul. 1973 155 p
(Contract ESTEC-1762/72-PP)
(ESRO-CR(P)-301) Avail: NTIS HC $9.75

The data flow in the earth resources aircraft facility ground station is presented. Input and output formats are described and the choice of preprocessing operations discussed. The various processing modules are described in detail together with implementation and interfaces. Typical ERAF processing chains are given illustrating the data flow tuning and the open shop usage. ESRO

N74-15894# Engins Matra, Velizy (France).
STUDY OF AN ERAF DATA PREPROCESSING FACILITY. VOLUME 3: ERAF SOFTWARE
Q. S. Earl (Plessey Radar Co.) Jul. 1973 183 p ref
(Contract ESTEC-1762/72-PP)
(ESRO-CR(P)-302) Avail: NTIS HC $11.25

The software needs for the various steps and system requirements of the Earth Resources Survey Aircraft are detailed. The aspects covered include preliminary processing; ADAS

processing; bulk processing; calibration and corrections; output processing and software cost, size and timing. ESRO

N74-15895# Engins Matra, Velizy (France).
STUDY ON AN ERAF DATA PREPROCESSING FACILITY. VOLUME 4: ERAF IMPLEMENTATION AND COSTS. STUDY CONCLUSION
M. Fuentes Losa (Sener), G. E. Lowitz, and J. C. Guillen Jul. 1973 67 p refs
(Contract ESTEC-1762/72-PP)
(ESRO-CR(P)-303) Avail: NTIS HC $5.50

The equipment requirements for the ground station of the earth resources aircraft facility are reviewed and evaluated. These include both data processing, photographic and television equipment. The building is considered, the architectural and furniture costs are noted and the electrical power, air conditioning and fire protection requirements are discussed. The station personnel are also discussed. A typical cost breakdown is given showing recurrent and non-recurrent costs. ESRO

N74-15896# Oxford Computer Services, Ltd. (England).
THE FAST FOURIER TRANSFORM AND ITS USE IN DIGITAL POWER-SPECTRAL AND CORRELATION ANALYSIS
R. Buckley Sep. 1972 35 p refs
Avail: NTIS HC $3.75

The use of the fast Fourier transform (FFT) in spectral analysis is described. A suitable FORTRAN subroutine for the FFT is presented and formulae are given which can be used directly in computer programs with the subroutine given. A summary of the entire numerical procedure required for spectral analysis is presented. The uses of the formulae are illustrated with computer generated time series and a full discussion is given of the practical problems involved in the use of time series or data runs of finite length. The work described provides a basis for a simple software package sufficiently general to meet most requirements of spectral and correlation analyses. It should be of particular interest to those processing. Author (ESRO)

N74-15897# Oxford Computer Services, Ltd. (England).
DATA COMPRESSION FOR ARCHIVING
J. O. Thomas (Imp. Coll. of Sci. and Technol., London), R. J. Hynds (Imp. Coll. of Sci. and Technol., London), L. Turner (Imp. Coll. of Sci. and Technol., London), and K. Heron Dec. 1972 306 p refs
(Contract ESOC-417/72-AR)
(ESRO-CR(P)-244) Avail: NTIS HC $17.50

The problems of on-ground compression of ESOC satellite data and data archiving are discussed. Four main methods of data compression, the Shannon-Fano, Run-Length, Hadamard, and Wiggle Code techniques, were considered. The theory and concepts underlying each of these techniques are discussed, and the results of applying the techniques to the compression of ESOC data are presented. Architectures for a large scale spacecraft data archive was discussed. Three methods of grouping the data were suggested. Their relative merits in terms of the data storage medium employed were considered. A complete set of file structures for an integrated access control system of the archive were developed. Author (ESRO)

N74-15898# Helsinki Univ. of Technology, Otaniemi (Finland). Radio Lab.
APLAC1: A FLEXIBLE FREQUENCY DOMAIN CIRCUIT ANALYSIS PROGRAM FOR SMALL COMPUTERS
Martti Valtonen 1973 46 p refs
(Rept-S-55) Avail: NTIS HC $4.50

The APLAC1 (Analysis program for linear active circuits) is a small nodal analysis program written in BASIC for the AC-analysis of linear networks. The basic elements accepted by APLAC1 are the lumped as well as independent, linear resistances, inductances, capacitances, and two types of controlled current sources. The output consists of the magnitudes and phases of the node voltages. Because of the flexibility of BASIC, APLAC1 is capable of performing the analysis of both lumped and distributed networks with mutual couplings and sensitivity, worst-case and Monte-Carlo analyses. Arbitrary n-ports may also be used in the networks to be computed. Author (ESRO)

N74-15899# Stanford Univ., Calif. Electronics Labs.
COST-EFFECTIVE PROCESSOR DESIGN WITH AN APPLICATION TO FAST FOURIER TRANSFORM COMPUTERS
Arvid G. Larson Aug. 1973 185 p refs
(Contract N00014-67-A-0112-0044; Grant NSF GJ-35584)
(AD-768886; SU-SEL-73-037; TR-73) Avail: NTIS CSCL 09/2

A cost-effective processor design is one that attains a high ratio of processing performance to processor component cost. This research investigates the circuit design of a processor or processing subsystems for cost effective implementation of a particular computation algorithm. The logic designs considered in this work use circuit components for which the delay and cost of functional building blocks or gates are known. A logic design technique is described that permits processing performance and cost comparisons among alternative computation algorithms and circuit technologies. It also provides a basis for contrasting alternative processor architectures, including both pipelined and parallel computing structures. (Modified author abstract) GRA

N74-15900# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN AUTOMATED DIGITAL DESIGN LANGUAGE FOR CLODS COMPUTERIZED LOGIC-ORIENTED DESIGN SYSTEM M.S. Thesis
Thomas J. Brown Jun. 1973 198 p refs
(AD-768346; GE/EE/73S-1) Avail: NTIS CSCL 09/2

Many aspects of digital design have been computerized in the past. Symbolic design, state reduction, state assignment, logic realization and simulation are a few of these individual processes. The computerized Logic-Oriented Design System (CLODS) is an attempt to consolidate previous individual efforts into an integrated digital design system. The thesis is a study of several symbolic design languages currently available which could be used in the symbolic design phase of an automated design system. One language, the Digital Design Language (DDL), is chosen as the most desirable in terms of conciseness, readability, and flexibility. A translation program, which converts a DDL description into Boolean equations and state tables, is implemented in the FORTRAN language using a previously written program as the basis. The method of translation and the actual programs are discussed in detail. (Modified author abstract) GRA

N74-15901# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
COMPUTERIZED LOGIC-ORIENTED DESIGN SYSTEM M.S. Thesis
Michael John Svisco Jun. 1973 164 p refs
(AD-768349; GE/EE/73S-6) Avail: NTIS CSCL 09/2

The Computerized Logic-Oriented Design System (CLODS) is a computer program written for the CDC 6600 computer located at Wright-Patterson Air Force Base. The program is intended as an educational tool and as a design aid for the students of the Air Force Institute of Technology. All of the various steps in the digital design process are covered by CLODS and these steps can be accessed either serially or individually. The major programs used by CLODS are: (1) a higher-order language (DDL) (2) a state reduction program; (3) state assignment programs; (4) a logic-hardware realization algorithm (GELAS); (5) a logic circuit drawing program; and (6) a digital logic simulator (DLS). CLODS essentially controls the execution of the above-mentioned programs. (Modified author abstract) GRA

N74-15902# Stanford Univ., Calif. Electronics Labs.
THE EVALUATION OF MICROPROGRAM IMPLEMENTED EMULATORS
Alan B. Salisbury Jul. 1973 115 p refs
(Contract N00014-67-A-0112-0044)
(AD-768883; SU-SEL-73-034; TR-60) Avail: NTIS CSCL 09/2

A new technique for estimating the performance of microprogram implemented emulators is developed and presented. This technique of Synthetic Emulation combines the concepts of mixes, kernel programs, synthetic programs and mathematical models, all adapted to the microprogramming environment. Methods are presented for the application of this technique to the problem of selecting host microprocessors for the emulation of one or

more target machines in a known workload environment. The process of emulation is examined and target machine attributes which impact on emulation efficiency are presented. Average Instruction Emulation Rate, or Emulation Power, is presented as a criterion for the evaluation and selection of host microprocessors for the emulation of target machine CPU's. The applicability of each of the traditional techniques of performance evaluation and measurement to microprogrammable processors is analyzed in some detail. (Modified author abstract) GRA

N74-15903# Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
NATURAL COMMUNICATION WITH COMPUTERS 4 Quarterly Progress Report, 1 Jul. - 30 Sep. 1973
Oct. 1973 53 p refs
(Contract DAHC15-71-C-0088; ARPA Order 1967)
(AD-769131; BBN-2670; QPR-12) Avail: NTIS CSCL 09/2

Broad based computer science research and development work is performed under the contract in areas including; speech understanding systems, speech compression, development of programs and programming aids, techniques for extending computer I/O capabilities, research and development on time sharing systems, and distributed computation. This research program involves the ability to represent knowledge and deal with it in computer oriented terms, requires systems capable of a high degree of man-machine interaction, and draws upon many diverse fields such as linguistics, communications, programming, hardware development, speech recognition, etc. to facilitate fuller use of the enormous potential of natural modes of communication with computers. (Modified author abstract) GRA

N74-15904# California Univ., Los Angeles. Dept. of Computer Science.
COMPUTER NETWORK RESEARCH Semiannual Technical Report, 1 Jan. - 30 Jun. 1973
Leonard Kleinrock, Gerald Estrin, Michel Melkanoff, Richard R. Muntz, and Gerald Popek 30 Jun. 1973 67 p refs
(Contracts DAHC15-69-C-0285; DAHC15-73-C-0368; ARPA Order 1380; ARPA Order 2496)
(AD-769706) Avail: NTIS CSCL 09/2

The semiannual technical report covers the period from January 1 through June 30, 1973. The efforts have been in four major areas: Advanced packet-switching systems, including multiaccess satellite and packet radio systems; computer communication network design; multiple resource multiple access computer systems models; measurements on the ARPANET itself. Also included are some network protocol studies and some controlled access and security questions. GRA

N74-15905# Signals Research and Development Establishment, Christchurch (England).
PARTIALLY CONNECTED MULTIPROCESSOR SYSTEMS: THE RING CONFIGURATION
J. S. Hill, H. K. Nichols, and J. M. Taylor Mar. 1973 16 p refs
(AD-769245; SRDE-73004; DRIC-BR36810) Avail: NTIS CSCL 09/2

The paper describes a new type of multiprocessor computer configuration, the Ring configuration. It provides an alternative way of using modular, off-the-shelf computer hardware such as main processors, core stores, input/output processors and disc controllers to produce flexible, high-integrity systems suitable for dedicated applications such as communications switching. The main objectives of the Ring configuration are to provide a system in which the connectivity of the hardware modules and the environment seen by the control software are independent of the overall system size, while retaining the basic advantages of modularity and multiprocessor operation, namely the ability to operate in a load-sharing mode which degrades gracefully under fault conditions. (Modified author abstract) GRA

N74-16647 Joint Publications Research Service, Arlington, Va.
WORK OF MATHEMATICAL COMPUTER CENTER DISCUSSED
Vasil Zenjo *In its* Transl. on Eastern Europe: Sci. Affairs, no. 377 (JPRS-60949) 9 Jan. 1974 p 1-2 Transl. into ENGLISH from Zeri i Popullit (Albania), 8 Dec. 1973 p 3 (For availability see N74-16646 07-34)

N74-16650 Joint Publications Research Service, Arlington, Va.
RESULTS, TASKS OF COMPUTER MEMORY RESEARCH HIGHLIGHTED
Gyorgy Pataki *In its* Transl. on Eastern Europe: Sci. Affairs, No. 377 (JPRS-60949) 9 Jan. 1974 p 19-23 Transl. into ENGLISH from Magyar Tudomany (Hungary), no. 9, Sep. 1973 p 613-616 (For availability see N74-16646 07-34)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N74-15906 British Library Lending Div., Boston Spa (England).
MICROELECTRONIC PHASE SHIFTERS IN X AND Q BANDS
C. Joussemet 5 Jul. 1973 24 p Transl. into ENGLISH from Rev. Tech. Compagn. France. Thomson-Houston (Paris), v. 4, no. 2, Jun. 1972 p 407-431
(BLL-PO-2988-(9022.81)) Avail: British Library Lending Div., Boston Spa, Engl.: 3 BLL photocopy coupons

The circuits discussed are three-bit reflection digital shifters operating the X and Q bands and employing PIN diodes. After giving a theoretical exposition about perturbance transmission phase shifters and reflection type 0 to 120 deg phase shifters. Data show how such phase shifters can be constructed in the hybrid integrated microcircuit technique and then gives the results obtained with such devices. Results also show that the phase shifters are compatible with electronic sweep aerials and may make it possible for such aerials to be used in mutiple function airborne radars. Author

N74-15907 Minnesota Univ., Minneapolis.
SPACE CHARGE SUPPRESSION OF NOISE IN GAS FILLED THERMIONIC DIODES Ph.D. Thesis
Ronald Arthur Stordahl 1973 96 p
Avail: Univ. Microfilms Order No. 73-25662

Space charge suppression of noise in a thermionic cylindrical diode filled with helium is measured over a wide range of operating conditions. The tungsten filament temperature is varied from 1590 to 1780 degrees Kelvin, anode to cathode voltage from zero to 20 volts, and the anode current from zero to one milliamp. The noise suppression factor is found to vary from 0.2 to unity. The noise characteristics are interpreted in the vacuum and low pressure case, at intermediate pressures and at high pressures. In the vacuum case, the noise is suppressed by the action of the space charge. The effect of reflection of electrons by the anode in the vacuum case and by collisions with helium molecules in the low pressure case results in partition noise.
Dissert. Abstr.

N74-15908 Rensselaer Polytechnic Inst., Troy, N.Y.
LONG RANGE TRENDS IN THE CHARACTER OF ELECTRIC POWER SYSTEMS Ph.D. Thesis
Charles A. Falcone 1973 388 p
Avail: Univ. Microfilms Order No. 73-27204

Long range trends in the development of electric power systems in the United States are discussed, emphasizing the Midwestern region. The historical growth of energy consumption in the United States is examined, along with present status and near-term prospects. Demographic and societal trends are discussed, and energy and electric power consumption are projected to year 2100, based on a scenario of future American society. The fuel resources of the United States are examined, as well as current and developmental energy conversion technology. A forecast of fuel use is developed. A history of energy systems is epitomized, with particular attention to electric power systems. Alternative energy systems are compared, and an examination of a hydrogen-electric system is included.
Dissert. Abstr.

N74-15909 Duke Univ., Durham, N.C.
VERY HIGH FREQUENCY DC TO DC CONVERSION AND REGULATION Ph.D. Thesis
YunMing Feng 1972 73 p
Avail: Univ. Microfilms Order No. 73-6566

Anticipated new space mission requirements have motivated research on very-high-frequency (VHF) regulated dc-to-dc converters designed to operate at conversion frequencies in the low-megahertz range. State-of-the-art electronic components and possible circuit means to achieve VHF operation are investigated and discussed. A closed-loop regulated VHF converter with bistable (non-linear) control is presented. The circuit is simple, capable of stepping-up and of stepping-down the input voltage to a regulated output voltage, and of sustaining wide variations in load. At the same time it provides converter input-output isolation and is self-starting. Although developed specifically to operate at very high switching frequencies in the low-megahertz range by utilizing minor-loop flux excursion in a saturable transformer, the basic converter circuit should also be useful at popular conversion frequencies in the low kilohertz range.
Dissert. Abstr.

N74-15910+ Toulouse Univ. (France). Lab. de Physique des Solides.
HF METHOD FOR THE DETERMINATION OF CARRIER LIFETIME INJECTED WHEN IN THE CENTRAL ZONE OF PIN DIODES. VERIFICATION OF NEW POSSIBILITIES, IMPROVEMENT AND APPLICATION TO OTHER DEVICES (THYRISTORS, TRIACS) Final Report [VERIFICATION DES POSSIBILITES NOUVELLES OFFERTES PAR UNE METHODE HYPERFREQUENCE DEMESUREDE LA DUREE DE VIE DES PORTEURS INJECTES DANS LA ZONE CENTRALE DES DIODES PIN. ETUDE D'UNE METHODE IMPULSIONNELLE. PERFECTIONNEMENT ET APPLICATION A D'AUTRES DISPOSITIES (THYRISTORS, TRIACS)]
M. Brousseau and J. Collet Nov. 1972 12 p refs In FRENCH
(Contract DGRST-70-7-2366)
Avail: NTIS HC $3.00

Techniques of implementation and procedures are detailed. The so-called double impulse method is shown to be of value for lifetimes higher than 0.1 microsecond and suited to industrial uses. it is the only method applicable to thyristors. In the thyristor case, the contribution of the two bases may be related to the effective lifetime and to the total potential drop. ESRO

N74-15911# Japan Broadcasting Corp., Tokyo. Image Devices Research Group.
NEW PHOTOCONDUCTIVE CAMERA TUBE, SATICON
Naohiro Goto, Yukinao Isozaki, and Keiichi Shidara Sep. 1973 9 p Prepared in cooperation with Hitachi, Ltd.
(NHK-Labs-Note-170) Avail: NTIS HC $3.00

An outlined feature of this new tube is presented along with descriptions of its target. The performance characteristics of the 2/3-inch tube are described in detail, and a summary of the characteristics and some possible applications are presented. Author

N74-15912# Cranfield Inst. of Technology (England). Dept. of Electronic and Control Engineering.
A STATIC TRANSISTOR MODEL FOR COMPUTER AIDED DESIGN
C. J. Feeney [1973] 25 p refs Sponsored in part by Min. of Def.
(Cranfield-E/C-4) Avail: NTIS HC $3.25

A study was made of a static or dc model of a high frequency transistor. Interest was concentrated upon the active region of operation together with the avalanche region. It is proposed that the model will be useful in network analysis programs and will be generally applicable to all transistors of a certain type. The model elements are determined from the pulsed V - I characteristics of the transistor and the element values so found are also confirmed by high frequency small signal measurements. It is intended that the measurement system used could be fully automated and the model element values found by the use of a computer routine. Author

N74-15913*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A FOUR-ELEMENT END-FIRE MICROPHONE ARRAY FOR ACOUSTIC MEASUREMENTS IN WIND TUNNELS
Paul T. Soderman and Stephen C. Noble Jan. 1974 45 p refs
(NASA-TM-X-62331) Avail: NTIS HC $4.25 CSCL 09A

A prototype four-element end-fire microphone array was designed and built for evaluation as a directional acoustic receiver for use in large wind tunnels. The microphone signals were digitized, time delayed, summed, and reconverted to analog form in such a way as to create a directional response with the main lobe along the array axis. The measured array directivity agrees with theoretical predictions confirming the circuit design of the electronic control module. The array with 0.15 m (0.5 ft) microphone spacing rejected reverberations and background noise in the Ames 40- by 80-foot wind tunnel by 5 to 12 db for frequencies above 400 Hz. Author

N74-15914# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
RECOMMENDATIONS FOR THE ELECTROMAGNETIC SHIELDING OF ROOMS
V. V. Chekhovich and N. B. Polonskii 10 Oct. 1973 135 p refs Transl. into ENGLISH from the monograph "Recommendations pour le Blindage Electromagnetique des Locaux" Sep. 1969 p 1-147
(AD-769315; FTD-HC-23-454-73) Avail: NTIS CSCL 13/13

Contents: Use of shielded rooms and chambers; Recommendations for design and installation of shielded rooms; Recommendations for construction of shielded chambers; Recommendations for admission and filtering of electrical conductors; Recommended procedures for testing the attenuation of rooms and filters. GRA

N74-15915*# EMR Aerospace Sciences, College Park, Md.
EXTENDIBLE-RETRACTABLE ELECTRIC FIELD MEASUREMENT ANTENNA FOR IMP J Final Report, Dec. 1971 - Aug. 1973
Wayne Larrick Aug. 1973 53 p refs
(Contract NAS5-23063)
(NASA-CR-132909; Rept-6341-2060) Avail: NTIS HC $4.75 CSCL 09E

An antenna dispenser mechanism for the IMP J spacecraft was designed, fabricated, and tested. Upon command the mechanism deploys or retracts a conductor for use as a receiving antenna for an electric field measurement experiment. Five identical units were fabricated and tested to the IMP H & J environmental test specification. Of these, four are designated for flight on the IMP J spacecraft and one as a prototype flight spare. The testing program was successfully completed although certain design modifications were required as problems were uncovered by the testing; particularly thermal vacuum operation. The antenna mechanism functions well under the expected environmental and loading conditions. The wear life and load capability of the dry molybdenum disulphide lubricant originally used on the heavily loaded worm and gear pair were disappointing and a substitute material was applied. The lubricant finally applied performed well; although other problems were generated.
Author

N74-15916*# TRW Capacitor Div., Ogallala, Nebr.
IMPROVEMENT PROGRAM FOR POLYCARBONATE CAPACITORS
Richard R. Bailey and K. D. Waterman Jul. 1973 70 p refs
(Contract NAS3-15688)
(NASA-CR-121238) Avail: NTIS HC $5.50 CSCL 09A

Hermetically sealed, wound, AC, polycarbonate capacitors incorporating design improvements recommended in a previous study were designed and built. A 5000 hour, 400 Hz ac life test was conducted using 384 of these capacitors to verify the adequacy of the design improvements. The improvements incorporated in the capacitors designed for this program eliminated the major cause of failure found in the preceding work, termination failure. A failure cause not present in the previous test became significant in this test with capacitors built from one lot of polycarbonate film. The samples from this lot accounted for 25 percent of the total test complement. Analyses of failed samples

showed that the film had an excessive solvent content. This solvent problem was found in 37 of the total 46 failures which occurred in this test. The other nine were random failures resulting from causes such as seal leaks, foreign particles, and possibly wrinkles. Author

N74-15917# Alabama Univ., Huntsville. Div. of Graduate Programs and Research.
STUDY OF DISTURBANCE ABSORBING CONTROLLERS FOR THE SERVOMECHANISM PROBLEM, PART 2 Final Technical Report, Apr. 1972 - Jun. 1973
Carroll D. Johnson Jun. 1973 90 p refs
(Contract DAAH01-72-C-0428)
(AD-766743) Avail: NTIS CSCL 12/1

The restricted theory for disturbance absorbing servo controllers, as developed by Dr. C. D. Johnson in 1971, is refined and generalized to cover a broad class of linear, possible timevarying servo systems with complex servo-command inputs and persistently acting, uncertain external disturbances. Author (GRA)

N74-15918# Tennessee Technological Univ., Cookeville. Dept. of Electrical Engineering.
AN ADAPTIVE TRANSMITTING ARRAY TO MAXIMIZE POWER FLOW IN A SPECIFIC DIRECTION Final Report, 1 Apr. - 30 Sep. 1973
Roy N. Adams, Joseph N. Anderson, and William L. Fuqua 24 Sep. 1973 33 p refs
(Contract N00019-73-C-0361)
(AD-768214) Avail: NTIS CSCL 09/5

The purpose of the research is to demonstrate a method of increasing a transmitting arrays output in a specified direction by adaptive techniques. The report describes an analytical development of an appropriate algorithm, a digital simulation of the system, and the experimental implementation together with test results at 300 MHz. (Modified author abstract) GRA

N74-15919# IBM Watson Research Center, Yorktown Heights, N.Y.
EFFICIENT MODE CONVERSION IN Gd(.5)y(2.5)Ga, IRON GARNET THIN FILM WAVEGUIDES Quarterly Technical Report, 15 Apr. - 15 Jul. 1973
Samuel C. Tseng, Axel R. Reisinger, and Carl G. Powell Sep. 1973 40 p refs
(Contract N00014-73-C-0256; ARPA Order 2327)
(AD-769132; QTR-2) Avail: NTIS CSCL 09/1

The implementation of periodic reversals of magnetization along the direction of propagation of light, at locations where TE and TM modes become 180 degrees out of phase, is discussed. Two approaches were followed: (1) the conventional electrical serpentine circuit and (2) a novel periodic permalloy structure. Using these techniques, we have observed conversion efficiencies of 92% and 80%, respectively, in two Gd5 Ga1 iron garnet thin film waveguides grown on GGG substrates. Experimental results are examined in the light of the theory of electromagnetic wave propagation through bulk crystals possessing both Faraday rotation and birefringence, adapted to the case of mode conversion in magneto-optic waveguides. Author (GRA)

N74-15920# Varian Associates, Palo Alto, Calif. TWT Div.
PARALLEL PULSED TWT AMPLIFIER Final Report, 1 Jun. - 30 Sep. 1973
Lawrence Wood Oct. 1973 58 p
(Contract N00014-73-C-0462)
(AD-769069) Avail: NTIS CSCL 09/5

Four 1 kW pulsed traveling wave tubes were combined in parallel to produce greater than 4 kW over the I/J band octave from 8.0 to 16.0 GHz. Combining loss due to phase and amplitude imbalance in the TWTs was found to average 0.2 db. Combining loss attributable to insertion loss and VSWR amounted to 0.5 db per output combining magic tee. Double-ridge waveguide magic tees and TWTs were evaluated for extended frequency operation and higher output power as a function of frequency while varying cathode voltage, grid drive voltage, input of drive level, and duty cycle. Author (GRA)

N74-15921# Westinghouse Electric Corp., Baltimore, Md. Systems Development Div.
BINARY-ADDRESSABLE SCAN-CONVERSION STORAGE TUBE Quarterly Report, 15 Apr. - 14 Jul. 1973
Haden J. Bourg and Gary Marx Oct. 1973 43 p
(Contract DAAB07-72-C-0052)
(AD-768908; ECOM-0052-7-72; QR-7) Avail: NTIS CSCL 09/1

The objective of the contract is to conduct a research and development program leading to the fabrication, testing, and delivery of a binary-addressable scan-conversion storage tube. The tube is to be capable of simultaneous write and non-destructive read operation at video frequencies up to 10 megahertz. The progress during this quarter has included redesign of the control electrodes so that a capacitance decrease by a factor of 40 will be realized. In addition, the bus bar design used for multiplexing on wafers 3,4,5, and 6 has been changed in order to eliminate electrode crossovers and an oxidation step. (Modified author abstract) GRA

N74-15922# Rhode Island Univ., Kingston. Dept. of Electrical Engineering.
MINIMAX RESTRICTED RANGE APPROXIMATION AND ITS APPLICATION TO THE DESIGN OF NONRECURSIVE DIGITAL FILTERS
James T. Lewis 28 Sep. 1973 40 p refs
(Contract N00014-68-A-0215-0006)
(AD-768871; URI-EE-4044/2) Avail: NTIS CSCL 09/5

The design of nonrecursive digital filters is effected by means of minimax approximation in which the approximation is constrained to lie between two given restraining curves. The computational method is a multiple exchange algorithm which is the analogue of the Remes exchange algorithm. Efficient formulas are derived for the implementation of the algorithm. For an important prototype problem the effect of imposing the constraints, in terms of increased error, is studied mathematically. Numerical examples are discussed. Author (GRA)

N74-15923# Panametrics, Inc., Waltham, Mass.
ELECTROMECHANICAL BANDPASS RESONATOR FREQUENCY-SELECTIVE DEVICE Final Report, 7 Jun. 1972 - 7 May 1973
Emmanuel P. Papadakis Aug. 1973 74 p refs
(Contract F30602-72-C-0455)
(AD-768965; RADC-TR-73-232) Avail: NTIS CSCL 09/5

The objective of this effort was to investigate electromechanical resonators that would permit the fabrication of field deployable spectrum analyzers for detecting mechanical vibrations generated by targets of interest. The advantages sought in this approach to target signature analysis include low cost, small size, low power consumption and reduced communications burden. This report describes the characteristics of several models of resonators that were constructed within the 175 to 800 Hz frequency range. The results indicate that it is feasible to build these devices in the frequency range of interest (20 to 2000 Hz) although the lower ranges are more difficult to achieve. These devices used piezoelectric transducers for coupling the energy in and out of the devices and attempts to directly couple audio or seismic energy to the input was only moderately successful. GRA

N74-15924# California Univ., Irvine. School of Engineering.
THRESHOLD BEHAVIOR OF A QUASI-OPTIMUM FM DEMODULATOR
Francis S. Nakamoto and Neil J. Bershad Jun. 1973 14 p refs
(Contract N00014-69-A-0200-9004; NR Proj. 042-290)
(AD-767734) Avail: NTIS CSCL 09/5

An analytical technique is presented here for obtaining approximate expressions for both the phase and message estimate variances for an FM demodulator. Numerical computation, for both above and below threshold operation, demonstrate the accuracy of the approximate expressions. Author (GRA)

N74-15925# New Mexico Univ., Albuquerque. Bureau of Engineering Research.
ELECTRON BEAM EVAPORATED ALUMINUM OXIDE GATE SILICON TRANSISTORS
Chang-Ching Cheng Oct. 1973 140 p refs
(Contract N00014-68-A-0158)
(AD-769168; EE-212(73)ONR-005) Avail: NTIS CSCL 09/1

Aluminum oxide films prepared by the electron beam evaporation of Al2O3 tablets were studied in metal-insulator-semiconductor devices. The structure of Al2O3 films is amorphous with a density of 2.25 gm/cc. The film conductivity is smaller than 5 x 10 to the 14th power (ohm-cm) and the breakdown strength is higher than 1,300,000 V/cm. The average relative dielectric constant is about 7. The interface surface states of the MIS sample are small in the middle of the forbidden band, gradually increasing toward the band edges. The MIS devices have interface surface state densities larger than 3.4 x 10 to the 10th power states/sq cm. Both n- and p-channel MOSFETs with electron beam evaporated Al2O3 as the gate insulator were fabricated successfully. The n-channel MOSFET has an average threshold voltage of -2.3 volts and an average channel mobility of 207 sq cm/V-sec. The p-channel MOSFET has an average threshold voltage of -1.5 volts and an average channel mobility of 103.5 sq cm/V-sec. The radiation resistance of the fabricated n- and p-channel MOSFETs was tested with neutrons, gamma rays, and electrons. (Modified author abstract) GRA

N74-15926# California Univ., Berkeley. Dept. of Physics.
CONVERSION GAIN AND NOISE IN A JOSEPHSON MIXER
Yuan Taur, John H. Claassen, and Paul L. Richards Oct. 1973 29 p refs
(Contract N00014-69-A-0200-1056)
(AD-769222) Avail: NTIS CSCL 09/5

Fundamental mixing at 36 GHz in non-hysteretic Nb point contacts has been observed with overall conversion efficiencies in the range 0.33< or = eta or< 4 and mixer noise temperatures in the neighborhood of (Taub M) approximately 200K. The observed conversion efficiencies are in good agreement with the Resistively Shunted model. The observed noise can be accounted for by assuming that the Johnson noise in the shunt resistor is the only source of noise driving the junction. Somewhat larger noise is seen from resonantly coupled mixers than is seen when the mixer is driven from an rf current source. Fundamental mixing in hysteretic junctions is limited to a narrow IF bandwidth and gives much larger conversion gain but also larger noise. Parametric amplification at the IF frequency is seen in hysteretic junctions. Fourth order harmonic mixing with omega sub (LO)/2 pi at 9GHz has been achieved with performance almost comparable to fundamental mixing. Cavity mode mixing appears less promising. Author (GRA)

N74-15927# Naval Underwater Systems Center, New London, Conn.
LUMPED-PARAMETER ANALYSIS OF THE CLASS 4 (OVAL) FLEXTENSIONAL TRANSDUCER
Gerald A. Brigham 15 Aug. 1973 187 p refs
(SF11121302)
(AD-769130; NUSC-TR-4463) Avail: NTIS CSCL 09/1

A complete dynamic analysis of the class-4 flextensional transducer is accomplished by placing the combined equations of motion for the shell, the internal and external acoustic pressure fields, and the piezoelectric stack into integral form and then iterating to determine the mechanical impedance (for the first two bending modes and first membrane mode) of the shell and the basic acoustic radiation impedance components for each mode. In addition, the electrical and mechanical impedances of the stack are developed to include the composite ceramic, electrode, and bonding-cement effects as well as the lateral-motion and lateral-resonance effects. The effects of radiating end plates and compliant-tube-plus-oil filled transducer cavities are analyzed by assuming that all shells in the composite transducer have a common radial velocity within the operating bandwidth of the transducer. A first-order estimate of the cylindrical axial wavenumbers (the eigenvalues of the shell velocity matrix) is made by using the above assumptions to diagonalize the matrix, which leads to a closed solution. All resulting acoustic impedances are then computed by substituting a corrected radial wave number into the original impedances. Although no specific data are included, the basic model developed in the report has been used to design several operational transducers. Author (GRA)

N74-15928# Naval Electronics Lab. Center, San Diego, Calif.
NELC DESIGNERS GUIDE FOR LSI, VOLUME 1
30 Jun. 1973 542 p refs
(AD-769663; NELC-TD-263-Vol-1) Avail: NTIS CSCL 09/5

The technical document presents guidelines and recommendations for the use of large-scale integrated (LSI) circuits in new designs. The material presented is based on a detailed survey of the state of the art of microelectronic devices and the experiences of government and commercial users of these devices. The guide presents information on the following topics relating to LSI: Design applications, process technologies, electrical characteristics, packaging considerations, availability of LSI circuits, design compatibility, reliability, and handling precautions. (Modified author abstract) GRA

N74-15929# Naval Undersea Center, San Diego, Calif.
SMALL, LOW-FREQUENCY, ELECTRO-MECHANICAL PROJECTOR DESIGN AND ANALYSIS Research and Development Report, Jan. - Jun. 1973
M. R. Knittel, J. T. Hunt, D. Barach, and J. W. Holloway Sep. 1973 50 p refs
(SF11371209)
(AD-769214; NUC-TP-362) Avail: NTIS CSCL 09/1

Three types of transducers were mathematically modeled to gain knowledge of the potentials and limitations of alternating lead- and ceramic-staved cylinder transducers, curved bender bar transducers, and ribbed-cylinder flextensional transducers. It was determined that bandwidth of alternating lead- and ceramic-staved cylinders can be maximized through careful choice of material composition, ceramic thickness, length-to-diameter ratio, and stave geometry. Analysis of the curved bender bar transducer showed that a small, light-weight, low-power output transducer could be built with an in-air resonance frequency between 100 and 500 Hz. A ribbed-cylinder flextensional transducer is basically a low-frequency narrowband device but modifications can be made to the current design which will lower its first in-air resonance frequency and improve its reliability. Author (GRA)

N74-15930# Naval Underwater Systems Center, New London, Conn.
CABLE DESIGN GUIDELINES BASED ON A BENDING, TENSION, AND TORSION STUDY OF AN ELECTRO-MECHANICAL CABLE
Rolf G. Kasper 23 Oct. 1973 50 p refs
(AD-769212; NUSC-TR-4619) Avail: NTIS CSCL 09/1

A 5-in. section of multiconductor armored cable was subjected to tension, torsion, and bending. Two analytical approaches were used, and the results were compared with those from experimental bending tests. One analytical approach, a modified fundamental beam theory using an equivalent beam method, was attempted without success. The other method, a finite element approach, proved to be a viable cable analysis method. A first-order approximate method (strain-displacement formulation) that can be used when a quick, approximate stress prediction is required is also proposed. Finally, a number of cable design guidelines based on analyses and experiment are presented. Author (GRA)

N74-15931# Naval Postgraduate School, Monterey, Calif.
STUDY OF Pb(1-X)Sn(X)Te AND Pb(1-Y)Sn(Y)Se PHOTODETECTORS M.S. Thesis
Arden Edwin Romsos Jun. 1973 69 p refs
(AD-769756) Avail: NTIS CSCL 09/1

Two photodetection studies of the narrow gap IV-VI alloy semiconductors were made. In the first study, the photoconductive response of Pb(0.9) Sn(0.1) Se and Pb(0.68) Sn(0.32) Se were investigated. In the second study, single heterojunction Pb(1-x) Sn(x)Te diodes fabricated by sequential depositions of p type Pb(0.86) Sn(0.32)Te and n type Pb(0.8) Sn(0.2)Te were studied. Results are discussed. GRA

N74-15932# Army Foreign Science and Technology Center, Charlottesville, Va.
SEMICONDUCTOR DEVICES AND THEIR APPLICATION, ISSUE 25, 1971
Ya. A. Fedotov 10 May 1973 419 p refs Transl. into ENGLISH from unidentified Russian report
(AD-769537; FSTC-HT-23-450-73) Avail: NTIS CSCL 09/1

The collection opens with an editorial. The following articles

are dedicated to new, promising directions in semiconductor electronics; power-industry electronics, superhigh frequency devices, optoelectronics, semiconductor quantum generators, new types of semiconductor devices. The collection also contains articles devoted to the principles of operation of semiconductor devices, design calculations regarding them, and discussions of their circuit applications. (Modified author abstract) GRA

N74-15933# Naval Postgraduate School, Monterey, Calif.
BROADBAND ANTENNA SYSTEMS REALIZED FROM ACTIVE CIRCUIT CONJUGATE IMPEDANCE MATCHING M.S. Thesis
Albert Kevin Perry Sep. 1973 91 p refs
(AD-769800) Avail: NTIS CSCL 09/5

The application of negative impedance converter circuits for use in extremely broadband antenna systems is proposed. The theory of short antennas, and means of achieving a conjugate impedance match to them, is discussed. Synthesis methods that yield the required converters, uncompensated or compensated, are presented. Lastly, the performance of several of the constructed antenna systems are compared with that of a 12 foot whip. Author (GRA)

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N74-15934# Pisa Univ. (Italy). Ist. di Electronica e Radiocontrolli.
INDUCTOR SIMULATION USING AN OPERATIONAL AMPLIFIER AS FIRST-ORDER LOW-PASS FUNCTIONAL BLOCK
Fulvio Capparelli 1972 11 p refs
(Publ-17) Avail: NTIS HC $3.00

A technique to simulate grounded or floating inductors is described. By this technique an inductor can be simulated by a circuit consisting of a single operational amplifier, having finite gain and one pole frequency characteristic, and three resistors. Compared with other schemes of inductor simulators, this circuit achieves an inductance with relatively high Q and uses only resistors as passive elements. Author

N74-15935# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
STUDY OF SILICON CHARACTERISTICS FOR THE DEVELOPMENT OF LARGE SCALE INTEGRATED CIRCUITS Final Report [ETUDE DE LA CARACTERISATION DU SILICIUM POUR LA REALISATION DE CIRCUITS INTEGRES A HAUT NIVEAU D'INTEGRATION (L.S.I.)]
B. Dessertenne and Y. Hubert 2 Jun. 1972 49 p In FRENCH
(Contract DegInf-71.80.077)
(Rept-2672) Avail: NTIS HC $4.50

In view of the development of large scale integrated circuits, the surface properties of silicon samples were investigated. The effects of all types of polishing, cleaning, and oxydation were taken into account. Thermal stresses which seem to play an important role in the defects noted were diminished by slow withdrawal from the oxidation oven. The topography by avalanche was compared to that obtained from X-rays by reflection at the silicon surface. Characteristics of the silicon samples were determined by examination of the electrical properties in the case that MOS capacitors are replaced by diodes. ESRO

N74-15936# Oxford Univ. (England). Engineering Lab.
SIMULATION STUDIES OF K-STEP-AHEAD CONTROLLERS
R. P. Ashton 1973 37 p refs
(Rept-1065/73) Avail: NTIS HC $4.00

The performance of an optimal K-step-ahead controller design algorithm is discussed which attempts to minimize the expected value of a cost-function K steps in the future using only information available at the present. The cost function is chosen as the weighted sum of output variance and the variance of a function of the control signal. The evaluation studies include the calculation of signal variance using both simulation and Parseval's theorem. Various classes of systems were investigated, including a non-minimum phase system. The K-step-ahead controller is shown to have practical advantages over controllers which minimize a cost function over an infinite horizon.
Author (ESRO)

N74-15937# Naval Ordnance Lab., White Oak, Md.
PROPOSED HYBRID MICROCIRCUIT FLAT PACKAGE DESIGNS
Hayden Morris 4 Apr. 1973 27 p refs
(AD-761153; NOLTR-73-76) Avail: NTIS CSCL 09/5

A need for a type of edge-connect hybrid microcircuit flat package is discussed. Several proposed designs are described, and detailed drawings and photographs are presented.
Author (GRA)

N74-15938# Harry Diamond Labs., Washington, D.C.
DESIGN AND ANALYSIS OF 90-DEGREE PHASE DIFFERENCE NETWORKS
W. Weibach May 1973 50 p refs
(HDL Proj. 47311)
(AD-769585; HDL-TM-73-4) Avail: NTIS CSCL 09/5

The parameters of a 90 degree phase difference (Dome) filter, and their relationship to the filter characteristics, are derived and discussed. The design of two RC implementations and their worst-case analyses are shown. Author (GRA)

N74-16644 Joint Publications Research Service, Arlington, Va.
FIRST HUNGARIAN CONFERENCE ON SYSTEMS THEORY REVIEWED
Istvan Kiss *In its* Transl. on Eastern Europe: Sci. Affairs, No. 380 (JPRS-61017) 18 Jan. 1974 p 28-39 Transl. into ENGLISH from Magy. Tud. (Budapest), no. 11, 1973 p 756-762 (For availability see N74-16643 07-34)

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N74-15939* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMES RESEARCH FACILITIES SUMMARY 1974
1974 104 p
(NASA-TM-X-69411) Avail: Technical Information Division, Ames Research Center, Moffett Field, California 94035 CSCL 14B

This book is a summary of selected facilities at AMES Research Center focusing on: (1) subsonic, transonic, and supersonic wind tunnels; (2) high enthalpy and hypersonic wind tunnels, shock tubes, and ballistic ranges; (3) flight simulators; (4) research aircraft; and (5) computers. Author

N74-15940 Stanford Univ., Calif.
BALLISTICS AND PROPULSION FOR A LUNAR HOPPING TRANSPORTER Ph.D. Thesis
Ronald James Meetin 1973 228 p
Avail: Univ. Microfilms Order No. 73-30441

A feasibility study has been completed on a hopping transporter concept for locomotion on the moon. Termed a Lunar Pogo because it would operate similarly to a conventional pogo stick, this transporter consists of a main body, a thrust leg, and a foot for take-off and landing. In operation, the main body accelerates up the inclined leg, picks up the leg and foot, and then enters ballistic flight. During flight the leg rotates toward the touchdown velocity vector. After the foot recontacts the lunar surface, the main body decelerates down the leg. The Lunar Pogo would be capable of operating in moderately rough lunar terrain. In a one-man version, an astronaut would typically

make 50-ft leaps at an average speed of 3 to 5 mi/hr. Propulsion for the Lunar Pogo would be supplied by the expansion of gas against a piston. The system would be partially conservative because much of the energy expended by the gas during take-off would be recovered by compressing the gas at landing.
Dissert. Abstr.

N74-15941# Bureau of Mines, Bartlesville, Okla. Energy Research Center.
CONTROLLED-ATMOSPHERE SYSTEM FOR TESTING GAS MONITORS
H. B. Carroll, Jr., R. M. Ray, and F. F. Armstrong 1973 13 p refs
(BM-RI-7859) Avail: NTIS HC $3.00

A controlled environment test chamber, designed and constructed specifically for instrument evaluation in simulated work atmospheres, is described. The atmosphere inside the 300-liter stainless steel chamber can be controlled at any selected temperature and relative humidity in the range of 2 to 93 C and 20 to 95 percent, respectively. Instruments placed inside the test chamber are subjected to an atmosphere at a preset temperature and humidity containing various concentrations of toxic gases such as CO, CO2, NO, NO2, SO2, and H2S. Toxic gas losses resulting from wall reactions, monitoring instruments, and instruments under evaluation are compensated by the use of a dynamic gas blending system. Author

N74-15942*# Singer Co., Binghamton, N.Y. Simulation Products Div.
SHUTTLE MISSION SIMULATOR BASELINE DEFINITION REPORT, VOLUME 1
J. F. Burke and D. E. Small 21 Dec. 1973 546 p refs
(Contract NAS9-12836)
(NASA-CR-134173) Avail: NTIS HC $29.50 CSCL 14B

A baseline definition of the space shuttle mission simulator is presented. The subjects discussed are: (1) physical arrangement of the complete simulator system in the appropriate facility, with a definition of the required facility modifications, (2) functional descriptions of all hardware units, including the operational features, data demands, and facility interfaces, (3) hardware features necessary to integrate the items into a baseline simulator system to include the rationale for selecting the chosen implementation, and (4) operating, maintenance, and configuration updating characteristics of the simulator hardware. Author

N74-15943*# Singer Co., Binghamton, N.Y. Simulation Products Div.
SHUTTLE MISSION SIMULATOR BASELINE DEFINITION REPORT, VOLUME 2
A. W. Dahlberg and D. E. Small 21 Dec. 1973 513 p refs
(Contract NAS9-12836)
(NASA-CR-134174) Avail: NTIS HC $27.75 CSCL 14B

The baseline definition report for the space shuttle mission simulator is presented. The subjects discussed are: (1) the general configurations, (2) motion base crew station, (3) instructor operator station complex, (4) display devices, (5) electromagnetic compatibility, (6) external interface equipment, (7) data conversion equipment, (8) fixed base crew station equipment, and (9) computer complex. Block diagrams of the supporting subsystems are provided. Author

N74-15944*# Singer Co., Binghamton, N.Y. Simulation Products Div.
SHUTTLE MISSION SIMULATOR REQUIREMENTS REPORT, VOLUME 1, REVISION C
J. F. Burke 21 Dec. 1973 441 p refs
(Contract NAS9-12836)
(NASA-CR-134166) Avail: NTIS HC $24.25 CSCL 14B

The contractor tasks required to produce a shuttle mission simulator for training crew members and ground personnel are discussed. The tasks will consist of the design, development, production, installation, checkout, and field support of a simulator with two separate crew stations. The tasks include the following: (1) review of spacecraft changes and incorporation of appropriate changes in simulator hardware and software design, and (2) the generation of documentation of design, configuration management, and training used by maintenance and instructor personnel after acceptance for each of the crew stations.
Author

N74-15945*# Techtran Corp., Glen Burnie, Md
THE LAUNCHING PAD OF THE BAYKONUR COSMODROME
Washington NASA Feb. 1974 11 p Transl. into ENGLISH of the publ. "Startovaya Ploshchadka Kosmodroma Baykonur' Leningrad, Nauka p 2-6
(Contract NASw-2485)
(NASA-TT-F-15364) Avail: NTIS HC $3.00 CSCL 14B

The launch facilities of the Baykonur cosmodrome, consisting of the launching pads and main facilities of the complex, including the launch tower, launch systems, service gantries and fueling systems, are described in terms of layout, structural arrangement, transportation, rocket prelaunch preparations, fueling, servicing and launch procedure. Author

N74-15946*# Flow Research, Inc., Kent, Wash.
THE CONSTRUCTION AND OPERATION OF A WATER TUNNEL IN APPLICATION TO FLOW VISUALIZATION STUDIES OF AN OSCILLATING AIRFOIL
John H. Olsen and Hsien Ta Liu May 1973 76 p refs
(Contract NAS2-6927)
(NASA-CR-114696; Rept-13) Avail: NTIS HC $6.00 CSCL 14B

The water tunnel which was constructed at the NASA Ames Research Center is described along with the flow field adjacent to an oscillating airfoil. The design and operational procedures of the tunnel are described in detail. Hydrogen bubble and thymol blue techniques are used to visualize the flow field. Results of the flow visualizations are presented in a series of still pictures and a high speed movie. These results show that time stall is more complicated than simple shedding from the leading edge or the trailing edge, particularly at relatively low frequency oscillations comparable to those of a helicopter blade. Therefore, any successful theory for predicting the stall loads on the helicopter blades must treat an irregular separated region rather than a discrete vortex passing over each blade surface. Author

N74-15947# Paris Univ., Orsay (France). Lab. de l'Accelerateur Lineaire.
[RESEARCH ACTIVITIES AND FUTURE SCIENTIFIC PROGRAM OF THE LINEAR ACCELERATOR LABORATORY]
A. Lagarrigue [1972] 17 p refs
(LAL-1262) Avail: NTIS HC $3.00

The origin and history of the Orsay Linear Accelerator Laboratory, France, is presented. The research possibilities are mentioned. Details of the electron linear accelerator and of the ACO storage ring are tabulated. The future scientific program is elaborated, including storage ring experiments, electronics experimental program at CERN, bubble chamber experimental program, and linear accelerator program. The construction of a new storage ring is described. ESRO

N74-15948# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Oberpfaffenhofen (West Germany). Zentralabteilung Satellitenbetrieb.
THE GERMAN SPACE OPERATIONS CENTER AND ITS USE FOR BILATERAL SPACE PROJECTS
Klaus Wiegand 1973 26 p refs Presented at the 13th European Space Symp., London, 25-27 Jun. 1973
Avail: NTIS HC $3.50

The German Space Operations Center and its facilities are described and a summary is given of experiences during missions of the bilateral projects Azur, Injun, and Aeros. An outlook on planned operations during future Helios and Symphonie missions is given. Author (ESRO)

N74-15949# Oxford Univ. (England). Dept. of Engineering Science.
A MAGNETIC SUSPENSION SYSTEM FOR THE MEASUREMENT OF SPHERE DRAG IN LOW DENSITY SUPERSONIC FLOW
H. Altmann Jun. 1973 78 p refs
(Rept-1062/73) Avail: NTIS HC $6.00

A magnetic suspension system was developed for measur-

ing sphere drag in the transition and near-free molecular regimes when used with a low density hypersonic wind tunnel. The restrictions that the tunnel placed upon the suspension system design are discussed, together with the methods used to accommodate them. The overall design is compared with that of other systems. The advantages and disadvantages of both linear and scanned optical detection methods are discussed, and their relevant control system theories are developed. The realization of these systems together with the method of controlling the electromagnets and measuring the forces on a suspended body are described. Author (ESRO)

N74-15950# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ONERA WILL PUT A LARGE ANECHOIC CHAMBER WITH A WIND TUNNEL IN SERVICE IN 1975
Jacques Morisset 10 Oct. 1973 13 p Transl. into ENGLISH from Air et Cosmos (Paris), v. 10, 10 Feb. 1973 p 23-25
(AF Proj. G101)
(AD-768424; FTD-HC-23-57-74) Avail: NTIS CSCL 14/2

The report describes the structural components of an anechoic chamber under construction in France. GRA

N74-15951# Naval Postgraduate School, Monterey, Calif.
A NOISE EXPOSURE FORECAST EVALUATION OF THE MONTEREY PENINSULA AIRPORT M.S. Thesis
Michael Reilly Merickel Sep. 1973 75 p refs
(AD-769814) Avail: NTIS CSCL 01/5

A computer program was used to obtain contours of noise exposure for the Monterey Peninsula Airport. Two scenarios are presented for the present volume of operations and the resulting NEF contours are shown. The same two plots, with a doubled volume of operations, are depicted for a relative comparison. These noise exposure forecasts can be used for noise evaluation and compatible land use planning in the vicinity of an airport. (Modified Author Asbtract) GRA

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N74-15952 Iowa State Univ. of Science and Technology, Ames.
AN EXPERIMENTAL INVESTIGATION OF BOUNDARY INTERFERENCE AT SUBSONIC SPEEDS IN A TWO-DIMENSIONAL PERFORATED-WALL WIND TUNNEL Ph.D. Thesis
Gerald Edwin Matyk 1973 152 p
Avail: Univ. Microfilms Order No. 73-26865

An experimental investigation of subsonic boundary interference in a two-dimensional, perforated wall wind tunnel was conducted, with the purpose of examining the effectiveness of the theoretical corrections, based upon an empirical porosity parameter. Airfoil lift, drag, and moment measurements were taken with wall porosities varying between 0 and 12%, and Mach numbers up to 0.9. Characteristic curves were obtained by plotting the mass flow through the walls versus the corresponding pressure difference across the walls. From these, porosity parameters were calculated. Correction factors were then obtained and the appropriate corrections were made to the airfoil data. The results indicate that the lift-curve slopes of the corrected perforated wall data are slightly smaller than those of the corrected closed wall data, i.e., the effective porosities were underestimated, but this discrepancy may be attributed to the uncertainty in the values of the porosity parameters. Dissert. Abstr.

N74-15953 Cincinnati Univ., Ohio.
THREE-DIMENSIONAL COMPRESSIBLE LAMINAR BOUNDARY LAYERS ON SHARP AND BLUNT CIRCULAR CONES AT ANGLE OF ATTACK Ph.D. Thesis
Zenon Popinski 1973 250 p
Avail: Univ. Microfilms Order No. 73-26125

A method for solving the three-dimensional compressible laminar boundary layer equations for the cases of sharp circular cones and spherically blunted cones at angle of attack are presented. The governing equations are modified by a similarity type transformation and then transformed into a Crocco-type form. The resulting set of equations is solved simultaneously by an iterative method using an implicit finite difference scheme. The effects of streamline swallowing on a sharp circular cone are included by introducing the true inviscid edge conditions at a distance from the wall equal to the boundary layer thickness. The validity of the approach is established by comparison of the computational results with similar results by other methods and with experimental data. It is concluded that at sufficiently high Mach number and moderate to large angles of attack and moderate or low Reynolds numbers, the streamline swallowing on a sharp cone results in higher values of skin friction and heat transfer as compared with the classical results for constant entropy. Dissert. Abstr.

N74-15954 State Univ. of New York, Albany.
EXPERIMENTS IN STRATIFIED SHEAR FLOW Ph.D. Thesis
William Theodore Sommers 1972 148 p
Avail: Univ. Microfilms Order No. 73-19706

The results of a series of laboratory experiments performed in a stratified shear flow apparatus are presented. The apparatus consists of annular fluid chamber bounded by insulating plexiglass sidewalls and conducting top and bottom aluminum discs. Shear is impressed by rotating the top disc while the remainder of the apparatus is held stationary. Experimental design and techniques are discussed. Linear steady state static stratification is set-up, in the contained experimental fluid, when the top disc is heated and the bottom disc is cooled. Stratification set-up occurs through differential interior vertical motions, in spite of stable macroscale temperature forcing. Temperature time series, from 16 interior thermocouples, and photographs define the set-up. Impression of the shear results in the rearrangement of the linear static density profile into a partitioned profile of weak and strong thermal gradients. Dissert. Abstr.

N74-15955 Minnesota Univ., Minneapolis.
OBSERVATION OF CIRCULATION IN ROTATING SUPER-FLUID HELIUM Ph.D. Thesis
Stephen Francis Kral 1973 163 p
Avail: Univ. Microfilms Order No. 73-25626

Measurements of the circulation of the super-fluid component of He II around a fine wire stretched along the axis of a cylindrical container have been made while the container and wire were in rotation. These measurements form an extension of earlier measurements made of the circulation around a fine wire in a similar container, but with the container and wire at rest. The circulation is measured by means of the influence it has on the transverse vibrations of the wire. Measurements were made at temperatures near to 1.30 K for rotation speeds in the range from 0 to plus or minus 4 rad/sec, and for wire diameters ranging from 60 to 90 microns. Both the magnitude and direction of the circulation were obtained. Two principal results are found. The first is that at a given rotation speed the circulation exhibits a high degree of metastability, with the metastable values found being at both integer and non-integer multiples of the circulation quantum. The second principal result is that as the rotation speed is changed continuously the circulation exhibits a series of step-like changes between metastable levels. These metastable levels appear at both integer and non-integer multiples of the circulation quantum. Dissert. Abstr.

N74-15956# Texas Univ., Austin.
EFFECTS OF THERMAL RADIATION ON THE MOTION OF A NORMAL SHOCK WAVE DURING REFLECTION FROM A RADIATING WALL Ph.D. Thesis
Michael Lynn Smith 1973 239 p
Avail: Univ. Microfilms Order No. 73-26090

The shock wave is treated as a discontinuity embedded in a structure due to radiation. The initial structure of the shock wave is due to radiation from the hot gas behind the shock. As the shock approaches the wall, changes are produced in the initial structure because of radiative emission, absorption, and reflection by the wall. The effects of self absorption and emission

in the gas on both sides of the shock are included. All nonequilibrium phenomena (conduction, chemistry, ionization, viscous effects, ect.), with the exception of radiation, are neglected, and the gas is assumed to be grey and thermally and calorically perfect. Velocity, temperature, pressure, density, and radiation heat flux are determined as functions of time and position on both sides of the incident and reflected shock. Dissert. Abstr.

N74-15957 Texas Univ., Austin.
DEVELOPMENT AND COMPARISON OF SEVERAL ANALYTICAL MODELS FOR THE PLANAR TURBULENT NEAR WAKE IN SUPERSONIC FLOW COMBINING COMPONENT AND CRITICAL POINT METHODS Ph.D. Thesis
Jimmie Hugh Smith 1973 162 p
Avail: Univ. Microfilms Order No. 73-26089

The supersonic turbulent base flow problem is solved with integral techniques. This resulting computer code, NRWAKE, performs a complete base flow analysis in 5 to 10 seconds on the CDC 6600. All desired flow parameters are obtained with accuracy consistent with the usual knowledge of input data. The heretofore separate branches of effort stemming from the Chapman-Korst component analysis and the Crocco-Lees critical point method are merged. The dichotomy is ended by using the Chapman-Korst component analysis to establish all flow parameters in terms of assumed values of base pressure. A final closure is then obtained by using two interpretations of the Crocco-Lees critical point theory to select the correct base pressure along with corresponding parameters of interest. The study compares results obtained with four independent closure models; two new models based on the Crocco-Lees critical point theory and two based on previously developed criteria which are used for confirmation and comparison. Dissert. Abstr.

N74-15958 Tennessee Univ., Knoxville.
ON THE MOTION OF A VISCOUS FLUID Ph.D. Thesis
Trevor Holmes Moulden 1973 31 p
Avail: Univ. Microfilms Order No. 73-27738

A new technique is presented for generating solutions to the equations for a continuum fluid flow. The method is based on the use of Green's theorem to convert the differential equation for the motion into an integral equation. The latter equation is solved by quadrature. As an example of its utility, the method is employed in the solution of the flow over a finite flat plate. Dissert. Abstr.

N74-15959 Colorado Univ., Boulder.
ENTRAINMENT IN TURBULENT WAKE FLOWS Ph.D. Thesis
Sreedhar Rao 1973 89 p
Avail: Univ. Microfilms Order No. 73-23234

The stability of the interface of an axisymmetric wake, produced behind a stationary sphere in a fluid moving with uniform velocity is examined. A dispersion relation is developed which indicates that the interface is unstable at all wavenumbers if the wake is treated as a viscous medium with an appropriate kinematic viscosity. This dispersion relation is used to develop a surface-strain energy spectrum of a known initial disturbance. The energy density is found to increase with time. The time rate of change of the effective energy band-width is small indicating a weakly dispersive medium. Based on the hypothesis that the entrainment rate is controlled by the energy transfer from the ambient medium to the wake throught the interface, the energy balance is computed. An examination of the energy balance equation leads to a critical wavenumber beyond which the energy transport to the wake through the interface is cut off. Dissert. Abstr.

N74-15960 Washington Univ., Seattle.
AN EXPERIMENTAL STUDY OF ALIGNED FIELD MAGNETO-FLUID DYNAMIC FLOW Ph.D. Thesis
Philip Alexander Pincosy 1973 193 p
Avail: Univ. Microfilms Order No. 73-27679

An experimental investigation was made of the behavior of the fluid flow and the magnetic field in a magneto-fluid dynamic flow. The most important result was the observation of the fast magneto-acoustic waves. The experimental study was performed using shock tube where an ionized test gas was produced by a strong shock wave. An axial magnetic field was applied to the shock tube flow and the interaction was produced by a cone model. Xenon was used as the test gas. Typical values of the magnetic Reynolds number and the interaction parameter, for the xenon test gas with P1 = 1.0 torr and Ms = 15, were 0.3 and 0.5 respectively. For the range of applied magnetic field (0.2 to 0.9 web/sq m) the Alfven Mach number was variable from greater than to less than unity. Between the conditions of zero magnetic field strength and 0.9 web/sq m no change in the shock wave angle for the flow over a wedge and a cone was observed. Dissert. Abstr.

N74-15961 Louisiana State Univ., Baton Rouge. Agricultural and Mechanical Coll.
THE SPIN-UP FROM REST OF A HOMOGENEOUS, VISCOUS FLUID IN A RIGHT CYLINDRICAL CONTAINER Ph.D. Thesis
William Benton Watkins 1973 82 p
Avail: Univ. Microfilms Order No. 73-27880

The spin-up from rest of a viscous, homogeneous fluid in a closed right circular cylinder is examined both experimentally and numerically. A laser Doppler velocimeter is used to measure the azimuthal velocity component of the transient spin-up flow in the laboratory. A numerical integration of the Navier-Stokes equation is used to simulate spin-up from rest over wide ranges of cylinder dimensions, viscosities and speeds of rotation. Dissert. Abstr.

N74-15962# Joint Publications Research Service, Arlington, Va.
TURBULENT FLOW IN FLEXIBLE PIPES AND RAMJET ENGINES
14 Dec. 1973 29 p refs Transl. into ENGLISH from Gidromekhan. (Kiev), no. 24, 1973 19 p
(JPRS-60785) Avail: NTIS HC $3.50

Experimental investigations are reported of turbulent flow in flexible pipes, hydro-gas ramjet engine models, and the ballasting method for increasing the thrust of a hydro-gas ramjet engine. For individual titles, see N74-15963 through N74-15965.

N74-15963 Joint Publications Research Service, Arlington, Va.
SOME RESULTS OF EXPERIMENTAL INVESTIGATIONS OF TURBULENT FLOW IN FLEXIBLE PIPES
A. P. Teslo and V. A. Zhoga *In its* Turbulent Flow in Flexible Pipes and Ramjet Engines (JPRS-60785) 14 Dec. 1973 p 1-7 refs Transl. into ENGLISH from Gidromekhan. (Kiev), no. 24, 1973 p 18-22 (For availability see N74-15962 07-12)

The results are reported of an experimental investigation on the reduction of friction by pliable surfaces. The experimental apparatus is described as well as the method of measurement. The results are presented in graphical form and include: (1) a comparison of the resistance of rigid polished pipe with that of flexible polyethylene pipe, (2) the dependence of the resistance of polyethylene pipe on the combination of radial strain and the properties of the damping fluids, and (3) the dependence of the resistance of rubber pipe on the combination of longitudinal and transverse strain and the properties of the damping fluid. D.L.G.

N74-15964 Joint Publications Research Service, Arlington, Va. **c28**
EXPERIMENTAL STUDY OF A MODEL OF A HYDRO-GAS RAMJET ENGINE
N. A. Prikhodko *In its* Turbulent Flow in Flexible Pipes and Ramjet Engines (JPRS-60785) 14 Dec. 1973 p 8-20 refs Transl. into ENGLISH from Gidromekhan. (Kiev), no. 24, 1973 p 65-73 (For availability see N74-15962 07-12)

An experimental investigation of a model of a hydro-gas ramjet engine was conducted in a water tunnel. An optimal combination of external characteristics and of parameters characterizing internal processes was obtained in order to verify theoretical calculations and judge the efficiency of the engine. The results are given and their significance is discussed. D.L.G.

N74-15965 Joint Publications Research Service, Arlington, Va. **c28**
EXPERIMENTAL INVESTIGATION OF A MODEL OF A HYDRO-GAS RAMJET ENGINE WITH FORCING OF THRUST BY BALLASTING
Yu. G. Mokeyev *In its* Turbulent Flow in Flexible Pipes and Ramjet Engines (JPRS-60785) 14 Dec. 1973 p 21-26 ref Transl. into ENGLISH from Gidromekhan. (Kiev), no. 24, 1973

p 73-77 (For availability see N74-15962 07-12)

An investigation was made of the increased thrust obtainable in a gas turbine installation by the injection of liquid into the through-flow passage of the engine, directly before the jet nozzle. The apparatus and the methodology used in the experiment are described. It was concluded from the results that: (1) It is possible by ballasting to substantially increase thrust and at the same time reduce the specific fuel consumption. (2) With optimum designing and further improvement of the liquid spraying system, the method of ballasting should prove to be an effective procedure for improving the thrust qualities of engines. D.L.G.

N74-15966# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.

TURBULENT MIXING OF CO-AXIAL JETS WITH PARTICULAR REFERENCE TO THE NEAR EXIT REGION

M. M. Ribeiro and J. H. Whitelaw Aug. 1973 30 p refs

(HTS/73/51) Avail: NTIS HC $3.50 CSCL 20D

Measurements, obtained with the hot wire anemometry, are reported in a coaxial jet flow where the inner and outer initial maximum velocities were the same. The hot-wire signal was processed with a modified, linearised procedure which is described. The downstream results show that the coaxial jet develops more rapidly than a single jet but that, for example, the Reynolds shear stress has not attained a self preserving condition at a distance of 30 external diameters. Particular attention was paid to the region of the wake of the pipe wall and two dominant frequencies were observed, corresponding to two orthogonal velocity components. The high frequencies of these fluctuations indicate that they must be regarded as turbulent fluctuations and, as might be expected, lead to regions of almost constant Prandtl and Prandtl-Kolmogorov length scales. The lack of isotropy and the change in orientation of the directions of the fluctuations, suggest that the details of the flow can only by represented by modelling procedures if the model includes conservation equations or third-order correlations. Author

N74-15967*# Kanner (Leo) Associates, Redwood City, Calif.

FLOW VISUALIZATION: OPTICAL METHODS OF ANALYZING FLOWS

R. Reznicek Washington NASA Feb. 1974 195 p refs Transl. into ENGLISH of the publ. "Visualisace Proudeni: Optickemetody Vysetrovani Proudeni Tekutin" Prague, Acad., 1972 177 p

(Contract NASw-2481)

(NASA-TT-F-15236) Avail: NTIS HC $11.75 CSCL 20D

A review is presented of all the methods of studying fluid flows which make it possible to obtain an optical recording, or image, of the properties of a flow field and their development in time. The methods discussed include those based on the introduction of particles into a fluid which have properties differing from those of the fluid, methods in which observations are made of the changes occurring in a special coating applied to the surface of a body in a fluid flow, and methods which take advantage of natural changes occurring in the optical properties of a fluid during flow. Author

N74-15968# Joint Publications Research Service, Arlington, Va.

BENEFICIAL USE OF CAVITATION BUBBLES

V. Bashkirov 14 Jan. 1974 14 p refs Transl. into ENGLISH from Nauka i Zhizn (Moscow), no. 10, 1973 p 55-60

(JPRS-60974) Avail: NTIS HC $3.00

Data are presented on the behavior of acoustic cavitation bubbles and their use in technological processes, such as ultrasonic cleaning of products and the removal of contamination. Author

N74-15969# National Research Council of Canada, Ottawa (Ontario).

CONICAL DIFFUSERS WITH INFLOW DISTORTION: ESTIMATED PEAK LOCAL VELOCITY AT EXIT

R. A. Tyler and R. G. Williamson Oct. 1973 28 p refs

(NRC-13716; LR-570) Avail: NTIS HC $3.50

A simple analytical expression relating exit and entry distortion factor, V sub max divided V sub mean, for a conical-type diffuser is derived. The expression involves two assigned constants, values for which are obtained from a quantitative fit of measured data for a series of six conical diffuser configurations, operated with cross-flow generated inflow distortion at entry distortion factors up to about 3.0. Corresponding expressions for momentum coefficient and static pressure recovery coefficient are presented and shown to reproduce observed trends. The correlation is used to indicate a lower bound to the peak local velocity at exit from a practical gas turbine exhaust system consisting of an unassisted diffusing elbow followed by a straight conical-type diffuser. Author

N74-15970# Defence Research Establishment Valcartier (Quebec).

THE APPLICATION OF ION PROBES TO WAKE DIAGNOSTICS

A. Cantin May 1973 115 p refs

(Proj. 95-51-10)

(DREV-R-664/73) Avail: NTIS HC $7.75

The range of ambient conditions influencing current collection by an ion probe immersed in the wake of a 2.7 inch diameter sphere flown at 15,000 feet/second in atmospheres at various pressures was examined; it is clear that the probe is immersed in a weakly ionized plasma and that current collection is collision-dominated. The set of general equations required to derive the current collected by a biased probe in a weakly ionized, collision-dominated plasma over the probe is given. The power law forms for expressing the functional dependence of the probe current on the independent variables were exploited to derive the effect on the mean current of variance and covariance coefficients of various variables when the probe is immersed in a turbulent wake. Author

N74-15971# National Research Council of Canada, Ottawa (Ontario). Translation Services.

DETERMINING BY CALCULATION THE CHANGES IN THE CONDENSATE CONTENT OF GAS DURING EXPLOITATION OF GAS-CONDENSATE FIELDS

Yu. V. Zheltov and V. V. Latonov 1974 11 p refs Transl. into ENGLISH from Gaz. Delo, Nauchn.-Tekhn. Sb. (Moscow), v. 11, 1969 p 4-7

(NRC-TT-1724) Avail: NTIS HC $3.00

An attempt was made to calculate the dependence of condensation dynamics on pressure from the results of laboratory and field investigations of gas-condensate mixtures from a given deposit. A determination was made of the characteristic points of behavior of the gas-condensate system, which are then used to solve current technological problems. For example, the condensation isotherms are used to investigate the problems related to the deposition of the condensate on the surface, the collection and transportation of gas and condensate, and the prevention of formation of hydrates. The characteristic points illustrating the changes in the condensate content of the gas may be used to determine the general dependence of this parameter on the pressure at constant temperature. This relationship must be represented in analytical form for the entire range of changes in the formation pressure during exploitation: from the start of condensation to the pressure at the end of exploitation. Several empirical determinations were of the dependence of the solubility of various liquids in compressed gases on changing the pressure. Author

N74-15972# National Research Council of Canada, Ottawa (Ontario). Translation Services.

EFFECT OF A POROUS MEDIUM ON LOSS OF CONDENSATE IN THE FORMATION

A. S. Velikovskii, Z. I. Kozlovtseva, and V. V. Yushkin 1974 12 p refs Transl. into ENGLISH from Gaz. Prom. (Moscow), v. 16, no. 2, 1971 p 5-8

(NRC-TT-1723) Avail: NTIS HC $3.00

The formation of losses of gas-condensate deposits throughout its entire development period were determined by a UGK-3 device. Investigations were carried out on recombined samples of the gas and the condensate taken prior to the start of development from the separator of the LPG-1 device. Data are also given on rock adsorbtion of methane at high and low pressures. E.H.W.

N74-15973*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

WIND TUNNEL INVESTIGATION OF AERODYNAMIC

CHARACTERISTICS OF A SCALE MODEL OF A D5 BULLDOZER AND AN M109 SELF-PROPELLED 155 mm HOWITZER

Georgene H. Laub and Hifu M. Kodani Jan. 1974 104 p Prepared in cooperation with Army Air Mobility R and D Lab., Moffett Field, Calif.

(NASA-TM-X-62330) Avail: NTIS HC $7.25 CSCL 20D

Wind tunnel tests were conducted on a scale model of a D5 bulldozer and an M109 self-propelled 155 MM howitzer to determine the aerodynamic characteristics of these typical externally-suspended heavy lift helicopter cargo configurations. Tests were made over a large range of pitch and yaw attitudes at a nominal Reynolds number per unit length of 1.5 x 10 to the 6th power. Author

N74-15974# Vrije Universiteit, Brussels (Belgium). Dept. of Fluid Mechanics.

APPLICATION OF A PERIODIC SAMPLING AND AVERAGING TECHNIQUE TO FLOW MEASUREMENTS IN TURBOMACHINES

Ch. Hirsch and P. Kool Sep. 1973 42 p

(VUB-STR-4) Avail: NTIS HC $4.25

A sampling and averaging technique of hot-wire signals is applied and developed for flow measurements in a turbomachine. A single-sweep sampler has been built and used in order to measure blade-to-blade velocity distribution behind a single stage compressor rotor in a standing reference frame. The sampling procedure is described first and is followed by a description of the hot-wire measuring method, using a single normal wire and neglecting radial velocities. From obtained results one can extract various informations on wake effects, losses and end-wall boundary layer properties. In the second part a detailed analysis is given of the single sweep sampling apparatus. Author

N74-15975# Vrije Universiteit, Brussels (Belgium). Dept. of Fluid Mechanics.

THE THREE-DIMENSIONAL END-WALL BOUNDARY LAYERS IN AXIAL FLOW COMPRESSORS

Ch. Hirsch Jun. 1973 51 p refs Presented at Course on Fluid Dyn. of Rotating Machines, Udine, Italy

(VUB-STR-3) Avail: NTIS HC $4.75

The influence of end-wall boundary layers in axial flow compressors is discussed. The radial-equilibrium equations are reviewed, in their axisymmetric form, since their solutions are the limit values for the wall boundary layers. The characteristics of the end-wall layers are discussed on basis of their three-dimensional character induced by the flow turning in the blades (secondary flow), the relative motion and the clearance. The incidence upon the blade forces in the wall region is noticed and the existence of blade force-defect thicknesses is stressed, whose sign can be positive or negative. Particular attention is given to the effect of the wall boundary layers on the energy exchange between fluid and machine. Examples of calculations on a one-dimensional model compressor as well as on a single stage experimental low speed compressor are finally presented in order to illustrate the basic possibilities of the theory. Author

N74-15976*# Old Dominion Univ. Research Foundation, Norfolk, Va.

CORRELATION OF HEAT TRANSFER FOR THE ZERO PRESSURE GRADIENT HYPERSONIC LAMINAR BOUNDARY LAYER FOR SEVERAL GASES

William J. Cook (Iowa State Univ. of Sci. and Technol.) Nov. 1973 14 p refs

(Contract NAS1-11707)

(NASA-CR-132400) Avail: NTIS HC $3.00 CSCL 20D

A theoretical study of heat transfer for zero pressure gradient hypersonic laminar boundary layers for various gases with particular application to the flows produced in an expansion tube facility was conducted. A correlation based on results obtained from solutions to the governing equations for five gases was formulated. Particular attention was directed toward the laminar boundary layer shock tube splitter plates in carbon dioxide flows generated by high speed shock waves. Computer analysis of the splitter plate boundary layer flow provided information that is useful in interpreting experimental data obtained in shock tube gas radiation studies. Author

N74-15977# Centre National de la Recherche Scientifique, Meudon (France). Lab. d'Aerothermique.

RAREFIED ATMOSPHERE FREE JET SIMILARITY [SIMILITUDE DES JETS LIBRES EN ATMOSPHERE RAREFIEE]

Michel Giat and Gerard Dupeyrat May 1973 41 p refs In FRENCH

(Rept-73-1) Avail: NTIS HC $4.25

To investigate aerodynamic characteristics evolution in rarefied gas free jets in the axial region beyond the Mach disk, density measurements were carried out in a low density wind tunnel using an electron gun. Geometrical, density, and jet axial similitude were evidenced in graphs. It was found that for the studied pressure range, the jets were similar. ESRO

N74-15978# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace Engineering.

INVISCID SUPERSONIC NONUNIFORM FLOWS OVER SHARP AND SPHERICALLY BLUNTED CONES AT ANGLE OF ATTACK. VOLUME 1: ENGINEERING REPORT Final Report, 1 Sep. 1969 - 1 Dec. 1972

Roie R. Black and Clark H. Lewis Wright-Patterson AFB, Ohio ARL Aug. 1973 115 p refs

(Contract F33615-70-C-1015; AF Proj. 7064)

(AD-768966; ARL-73-0124-Vol-1) Avail: NTIS CSCL 20/4

A system of computer programs was developed to solve supersonic inviscid nonuniform flows over sharp and spherically blunted cones at angles of attack. For blunt cones the flow fields considered were axisymmetric wake flows situated so that flow in the subsonic nose region remained axisymmetric. For sharp cones both axisymmetric wake flows and two-dimensional shear flows were considered. The programs incorporate a modified inverse method for solving subsonic flow regions and modified axisymmetric and three-dimensional method of characteristics procedures for solving supersonic flow regions. (Modified author abstract) GRA

N74-15979# Massachusetts Inst. of Tech., Cambridge. Fluid Mechanics Lab.

THE EFFECT OF HOLDUP ON EQUILIBRIUM DROP SIZES IN AN AGITATED TANK

Michael A. Delichatsios and Ronald F. Probstein Jul. 1973 30 p refs

(Contract N00014-67-A-0204-0057)

(AD-766919; Pub-73-8) Avail: NTIS CSCL 07/1

Equilibrium drop sizes are calculated for a dispersed liquid phase (ie. oil in water) in an agitated tank under conditions of non-negligible holdup. The unsteady pressure forces across a drop necessary to break it against the resistance of surface tension are estimated assuming a locally isotropic turbulent field. A coalescence frequency based on binary drop collisions is equated to the breakup frequency to yield a semi-empirical relation that gives the increase in drop size with holdup over the zero holdup value. The relation explains some divergences among reported experimental results and correlates all data from similarly stabilized systems. Author (GRA)

N74-15980# California Univ., Riverside. Dept. of Mathematics.

GENERALIZED AND CLASSICAL SOLUTIONS OF THE NONLINEAR STATIONARY NAVIER-STOKES EQUATIONS

Victor L. Shapiro 1973 41 p refs

(Grant AF-AFOSR-2456-73; AF Proj. 9749)

(AD-768613; AFOSR-73-1921TR) Avail: NTIS CSCL 20/4

New regularity results in domains of Euclidean 3-space are established for the generalized solutions of the nonlinear stationary Navier-Stokes equations in terms of Dini criteria on the external force. Author (GRA)

N74-15981# Army Mobility Equipment Research and Development Center, Fort Belvoir, Va.

TURBULENT DIFFUSION IN ROUND TUBES Interim Report, Sep. 1971 - Jun. 1972

J. A. Zwolinski, S. W. Chi, and A. S. Patil Feb. 1973 60 p refs

(DA Proj. 1T0-61101-A-91A)

(AD-761076; USAMERDC-2053) Avail: NTIS CSCL 20/4

Fully developed turbulent flow of air at Re = 15000 to 30000 entered a porous tube with circular cross section. Helium

and air were injected uniformly through the tube wall for 36 radii at various ratios of mass velocity through the tube wall to the average mass velocity at the entrance cross section of the tube ranging from 0.0001 to 0.0004. Measurements of the velocity field were made for air injection, and measurements of helium concentration were made for helium injection. Within the tested range of air injection, the distortion of the fully developed velocity profile was negligible. A numerical solution of the diffusion equation was obtained based upon the assumption that the non-dimensional velocity distributions, u/u (avg), was a function of the entrance Reynolds number but independent of small wall-mass injection rates. Prandtl mixing length theory incorporating Van Driest's damping factor generalized by Kinney and Sparrow for the case of wall-mass transfer was used to evaluate effective diffusivity for turbulent flow. (Modified author abstract) GRA

N74-15982# New York Univ., N.Y. Courant Inst. of Mathematical Sciences.
ON THE SETTLING SPEED OF FREE AND FIXED SUSPENSIONS Interim Report
Philip G. Saffman 12 Dec. 1972 16 p refs Repr. from Studies in Applied Math., v. 52, no. 2, Jun. 1973 p 115-127
(Contract N00014-67-A-0467-0027)
(AD-768261/0GA; SIR-7) Avail: NTIS CSCL 20/4

Dilute suspensions of small spheres in a viscous fluid are examined for the three cases of: a regular periodic array, a random array of freely moving particles, and a random array in which the particles are held rigidly. It is known that the difference between average force and average velocity for a particle is a different function of concentration for the three cases. A unified analytical treatment is given for the point particle approximation, which explains the different qualitative dependence on concentration. It is shown that the differences between 1 and 2 are kinematical in nature, depending entirely on the difference between the geometries of regular and random arrays. The different result of case 3 is due to the shielding effect of a dilute suspension when the velocities, but not the forces, of the particles are fixed. Author (GRA)

N74-15983# Naval Postgraduate School, Monterey, Calif.
SIMULATION OF LOW SPEED FORWARD SHIP MOTION IN THE WIND M.S. Thesis
Behlul Ozdemir Dec. 1972 125 p refs
(AD-758502) Avail: NTIS CSCL 13/10

The objective of the study was to examine the relationship between forward ship motion and the effects of aerodynamic and hydrodynamic disturbances on motions in the horizontal plane. It includes course control and stability analysis for the unsteered and steered cases (manual and automatic) using several sets of operating conditions. Hydrodynamic and aerodynamic effects are considered to be functions of hull motion, rudder (steered cases), propeller and wind effects ratio. A dimensionless mathematical model has been developed and solved with respect to ship axes. Author (GRA)

N74-15984# California Univ., Berkeley. Coll. of Engineering.
A SINGULARITY-DISTRIBUTION METHOD FOR FREE-SURFACE FLOW PROBLEMS WITH AN OSCILLATING BODY
Ronald Wai-Chun Yeung Aug. 1973 132 p refs
(Contract N00014-69-A-0200-1023; NR Proj. 062-181)
(AD-768905; NA-73-6) Avail: NTIS CSCL 20/4

Boundary value problems associated with the forced oscillation of a body of general shape in the free surface of an inviscid fluid are considered. The originally external boundary value problems are first converted to internal ones by applying the radiation condition at a finite distance from the source of disturbances. Next, application of Green's theorem, using the source function for an unbounded fluid, reduces the problem to the solution of an integral equation with the unknown function being the velocity potential along the entire boundary of the fluid. No restrictions on the body shape nor the bottom geometry are necessary. A modified method to deal with the case of an infinitely deep fluid is also presented. (Modified author abstract) GRA

N74-15985# Naval Research Lab., Washington, D.C.
ON THE GROWTH AND COLLAPSE OF MIXED REGIONS IN STRATIFIED FLUIDS Final Report
K. G. William 25 Sep. 1973 40 p refs
(NRL Proj. G01-06)
(AD-769093; NRL-7586) Avail: NTIS CSCL 20/4

Experimental observations were made of the development of a mechanically generated, mixed region in the interior of a density-stratified fluid. The results showed that internal waves were initiated in the exterior unmixed fluid before the mixed region reached its maximum vertical extent and began to collapse. Author (GRA)

N74-15986# Naval Ordnance Lab., White Oak, Md.
A DRAG MODEL FOR CAVITATING AXISYMMETRIC BODIES
John R. Guala, Jr. and Charles W. Smith 1 Sep. 1973 59 p refs
(AD-769273; NOLTR-73-173) Avail: NTIS CSCL 20/4

A method for predicting the steady drag on cavitating axisymmetric bodies is presented. Portions of axisymmetric ellipsoids are fitted to the bodies and the forces acting on the bodies are assumed to be the pressure forces acting on the portions of the ellipsoids used. The pressure is calculated as if the ellipsoids were fully wetted in an ideal fluid. The method is accurate for practical purposes for body shapes for which data are available. On this basis, it is applied with confidence to other axisymmetric shapes. Author (GRA)

N74-15987# Calspan Corp., Buffalo, N.Y.
SHOCK WAVE - BOUNDARY LAYER INTERACTION IN HYPERSONIC FLOW Final Scientific Report, Jan. 1970 - Mar. 1973
Michael S. Holden Wright-Patterson AFB, Ohio ARL Oct. 1973 81 p refs
(Contract F33615-70-C-1280; AF Proj. 7064)
(AD-769648; CALSPAN-AI-2920-A-1; ARL-73-0137) Avail: NTIS CSCL 01/1

A study is presented of attached and separated turbulent viscous interaction regions resulting from shock wave-boundary layer interaction in hypersonic flow. The direct measurements of surface shear indicated that turbulent boundary layer separation occurred well before an inflection point was observed in the surface pressure distribution through the interaction region. It was found that the incipient separation conditions for both shock- and wedge-induced interaction regions can be correlated in terms of the local Mach number and the properties of the turbulent boundary layer ahead of the interaction. The length of the separated regions induced both by externally generated shocks and on compression surfaces was found to increase with increasing Reynolds number and wall-to-free stream stagnation temperature and decreasing Mach number of the free stream. Correlations for the plateau pressure and the heat transfer rate at reattachment and in the plateau region are presented. The fluctuating pressure measurements indicated that turbulent viscous interaction regions in separated flow are highly unsteady, and that this unsteadiness is reflected in the observed motion of the separation and reattachment points. (Modified author abstract) GRA

N74-15988# Polytechnic Inst. of Brooklyn, Farmingdale, N.Y. Dept. of Aerospace Enginering and Applied Mechanics.
TRANSONIC FLOW CALCULATIONS IN TWO AND THREE DIMENSIONS Interim Report
P. K. Khosla and S. G. Rubin Jun. 1973 32 p refs
(Grant AF-AFOSR-1843-70; AF Proj. 9781)
(AD-769301; PIBAL-73-13; AFOSR-73-1976TR) Avail: NTIS CSCL 20/4

In recent years attempts to improve the performance of nozzle, rotors, compressors, airfoil sections, wings, and airplanes have revived research efforts in transonic aerodynamics. The present investigation describes various aspects of transonic flow calculations by a relaxation method. Of primary interest are techniques to reduce computational times for three-dimensional flows. Solutions of the small disturbance and full three-dimensional potential flow equations are obtained for two- and three-dimensional geometries. Several different geometries are considered. (Modified author abstract) GRA

N74-15989# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

A STATE-OF-THE-ART SURVEY OF THE MECHANICS OF RAREFIED GAS FLOWS. PART 1: FUNDAMENTAL EQUATIONS
K. S. Nagaraja Sep. 1973 78 p refs
(AF Proj. 7064)
(AD-769478; ARL-73-0134) Avail: NTIS CSCL 20/4

Several theoretical methods which are adopted for solving the problems of rarefied gas flows are explored in this theory. As the analytic approaches are based on the elements of probability laws and kinetic theory, a review of the method of classical and statistical mechanics is given. After deriving the classical Boltzmann equation for dilute gases starting with the Liouville's equation, some approximate analytical methods of solving the Boltzmann equation are discussed. The approximate analytical methods involve either expansions, in appropriate ways, of the molecular velocity distribution functions, or physical modeling of the collisional integrals of the Boltzmann equation. Some comments of the computational techniques are made in part 1, and more detailed information about these techniques will be provided in part 2 of the survey to be published in the near future. Author (GRA)

N74-15990# Ballistic Research Labs., Aberdeen Proving Ground, Md.
FREE OSCILLATIONS OF A LIQUID DURING SPIN-UP
Y. M. Lynn Aug. 1973 45 p refs
(AD-769710; BRL-1663) Avail: NTIS CSCL 20/4

Eigenfrequencies of a liquid in a fully-filled circular cylinder during spin-up are shown to be always real (hence the flow is stable), provided that there is no singularity (critical layer) in the flow. For rotationally symmetric disturbances the liquid eigenfrequencies at several successive instants during the phase of spin-up are determined. The conditions for the existence, the location, as well as the nature of the singularity based on an inviscid formulation are demonstrated. Regular and singular solutions of the inviscid system having a critical layer in the flow, are obtained in series form. The exact viscous system governing amplitudes of arbitrary disturbances is reduced to two coupled equations in two dependent variables. A differential equation governing approximately the viscous disturbances in the vicinity of a singularity is obtained. Author (GRA)

N74-15991# Michigan Univ., Ann Arbor. Dept. of Naval Architecture and Marine Engineering.
FLUTTER-LIKE OSCILLATIONS OF A PLANING PLATE Final Report
T. Francis Gilvie and Young-Tsun Shen Jul. 1973 34 p refs
(Contract N00014-67-A-0181-0019; NR Proj. 062-421)
(AD-769005) Avail: NTIS CSCL 20/4

By means of a linear analysis, it is shown that the steady motion of a planing plate in two dimensions is always unstable in heave; the vertical motion of the water ahead of the plate causes the plate to have an effective chord length which oscillates along with any heave oscillation, and the damping coefficient of such an oscillation is negative if the reduced frequency is less than a computed critical value. This result suggests that 2-D planing is always unstable. However, when the planing plate supports a given load and has a given angle of attack, the flow will be more like that of a supercavitating hydrofoil at low speeds, and only at high speed will the characteristic planing flow be established. (Modified author abstract) GRA

N74-15992# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
ELECTROMAGNEITC FIELDS PRODUCED BY TURBULENCE IN CHARGED FLUIDS Final Report, Dec. 1971 - Dec. 1972
L. E. Koehler, G. E. Webber, and D. R. Rask Oct. 1973 66 p refs
(Contract F33615-72-C-1051; AF Proj. 7071)
(AD-769444; Rept-12339-FR; ARL-73-0140) Avail: NTIS CSCL 20/4

The report presents the results of an investigation of the electromagnetic fields produced by an inhomogeneously charged, turbulent fluid. During the program the intensities and spectra of a free subsonic air jet seeded with charged water droplets were investigated. The measurements were correlated with an existing theoretical model of a charged turbulent region with a fluctuating boundary. The simplified mathematical model showed agreement with the measurements within an order of magnitude. During the experimental program a charge-seeding generator with a charge density of approximately 8/100,000 coulombs per cubic meter created the free air jet. The electric field fluctuations were measured with a field probe with a fiber-optic data link. The time-varying field was in the order of several hundred volts per meter rms in a frequency spectrum from 4 Hz to 5 KHz at a distance of 1 meter downstream from the nozzle. An attempt to scale the obtained results to a seeded aircraft wake vortex indicates that a detection range of up to 100 meters is feasible, but further experiments are necessary to confirm this estimate. Author (GRA)

N74-16409 British Library Lending Div., Boston Spa (England).
REALIZATION AND EXPERIMENTAL INVESTIGATION OF TWO-DIMENSIONAL TURBULENT FLOW BEHIND A CYLINDER
Yu. B. Kolesnikov and A. B. Tsinober *In its* Seventh Conf. on Magnetic Hydrodynamics. Pt. 1: Gen. and Theoret. Probl. of MHD (BLL-M-23125-(5828-4F)) 1972 5 p refs Transl. into ENGLISH of the book "General and Theoretical Problems of MHD" USSR, Zinati Publishing House, 1972 5 p (For availability see N74-16408 07-25)

N74-16410 British Library Lending Div., Boston Spa (England).
REALIZATION AND EXPERIMENTAL INVESTIGATION OF TWO-DIMENSIONAL TURBULENT FLOWS BEHIND A GRID AND IN A DUCT
Yu. B. Kolesnikov and A. B. Tsinober *In its* Seventh Conf. of Magnetic Hydrodynamics. Pt. 1: Gen. and Theoret. Probl. of MHD (BLL-M-23125-(5828-4F)) 1972 4 p refs Transl. into ENGLISH of the book "General and Theoretical Problems of MHD" USSR, Zinati Publishing House, 1972 4 p (For availability see N74-16408 07-25)

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N74-15993 California Inst. of Tech., Pasadena.
METRIC THEORIES OF GRAVITY AND THEIR ASTROPHYSICAL IMPLICATIONS Ph.D. Thesis
Wei-Tou Ni 1972 84 p
Avail: Univ. Microfilms Order No. 73-26475

Metric theories of gravity are compiled, and are classified into four groups: (1) general relativity, (2) scalar-tensor theories, (3) conformally flat theories, and (4) stratified theories. The post-Newtonian limit of each theory is constructed and its parameterized post Newtonian values are obtained. These results, when combined with experimental data and with recent work, show that, of all theories thus far examined, the only currently viable ones are general relativity, the Bergmann-Wagoner scalar-tensor theory and its special cases, vector-tensor theory, and the stratified theory. Dissert. Abstr.

N74-15994 New Mexico Univ., Albuquerque.
STRUCTURE AND FLUCTUATIONS OF THE OH AIRGLOW AT 1.65 AND 2.15 MICRON Ph.D. Thesis
Lois May Kieffaber 1973 244 p
Avail: Univ. Microfilms Order No. 73-27768

The structure and fluctuations of the infrared airglow were studied at 1.65 and 2.15 microns. The emission at 1.65 microns is due to the (5,3) and (6,4) rotation-vibration bands of the OH molecule, and the 2.15 microns emission is due to the (9,7) OH band. Observations were made at Capilla Peak Observatory, New Mexico, and Haleakala Observatory, Hawaii, using two scanning photometers, of apertures 12 and 24 inches, equipped with interference filters and lead sulphide cells as detectors. The photometers have fields of view of the order of one degree, permitting the resolution of very small scale spatial structure.

Half-sky and all-sky maps reveal striations and cellular strutures at both wavelengths. Small patches of bright and faint emission, of angular dimension 2 to 15 deg are seen, in addition to very large slowly moving intensity clouds which cover significant fractions of the sky. Dissert. Abstr.

N74-15995 Geological Survey, Washington, D.C.
BIBLIOGRAPHY AND INDEX OF US GEOLOGICAL SURVEY PUBLICATIONS RELATING TO COAL, 1882 - 1970
Paul Averitt and Lorreda Lopez 1972 177 p refs Supersedes Circular-86
(Bull-1377; Circ-86) Avail: SOD HC $0.75

About 1,300 U.S. Geological Survey publications related to coal and published prior to January 1, 1971, are listed in the bibliography and index. The reports are listed alphabetically by names of authors or senior authors, and reports of individual authors are listed chronologically. Reports are included describing results of technologic work on coal conducted by the Geological Survey prior to 1910, along with the results of statistical work carried on prior to 1924. Author

N74-15996 Cincinnati Univ., Ohio.
THE GENERATION OF OCEAN WAVES BY A TURBULENT WIND Ph.D. Thesis
James Hamilton Stuhmiller 1973 155 p
Avail: Univ. Microfilms Order No. 73-24821

Work covering three major areas of turbulent wind generation of ocean waves is reported. Data cover: airflow over water waves suitable to oceanographic conditions, stability of turbulent flows in the presence of a flexible boundary, and a theory of ocean wave growth. Dissert. Abstr.

N74-15997 New York State Univ., Albany.
RING CURRENT INDUCTIVE ELECTRIC FIELDS AND THEIR EFFECT ON THE MOTION OF CHARGED PARTICLES IN THE EARTH'S MAGNETOSPHERE Ph.D. Thesis
Charles Herbert Murphy 1973 123 p
Avail: Univ. Microfilms Order No. 73-31184

The inductive electric fields investigated were those produced by the time-dependent behavior of the magnetospheric ring current. Two models of the ring current were considered. First, a distributed current due to protons drifting in a dipole magnetic field was used to represent the symmetric ring current of the geomagnetic storm. Second, a more complex configuration was used to represent the asymmetric ring current which exists during the magnetic substorm. This asymmetric ring current model included ionospheric currents and an eastward flowing partial ring current in the midnight sector. The current in both models was assumed to decay exponentially with time, thereby generating the inductive electric field. Dissert. Abstr.

N74-15998 California Univ., Los Angeles.
AN EXPERIMENTAL AND NUMERICAL INVESTIGATION OF THE EVOLUTION OF ICE PARTICLES IN ATMOSPHERIC CLOUDS Ph.D. Thesis
Richard Leon Pitter 1973 290 p
Avail: Univ. Microfilms Order No. 73-28748

Experimental investigations of processes occurring during the freezing of cloud drops were performed in a cloud tunnel. Numerical studies, examining the flow fields, ventilation coefficients, and interaction with cloud drops of thin hexagonal plates of ice idealized as appropriately shaped oblate spheroids, were performed on an IBM 369/91 computer and a CDC 6400 computer. An investigation of drop freezing yielded a linear relation between the mean freezing temperature and the logarithm of the drop volume for any particular water sample. A comparison between contact nucleation and suspension nucleation of two natural clay dusts revealed a great difference in nucleation activity according to the mode of nucleation. Drop freezing by contact nucleation with montomorillonite particles was detected as warm as -3 C. Dissert. Abstr.

N74-15999 Wisconsin Univ., Madison.
ON THE HEAT BUDGET OF THE SUMMER TROPOSPHERE OVER THE TROPICAL WESTERN PACIFIC Ph.D. Thesis
James Froome Kimpel 1973 117 p
Avail: Univ. Microfilms Order No. 73-21004

The net radiational heating of a portion of the tropical atmosphere-ocean system and the subsequent export of energy poleward is examined from a heat and moisture budget approach. Intense upper air and surface observations obtained during the nuclear tests of 1956 and 1958 in the Marshall Islands region provide the major data bank. Export of atmospheric heat and moisture is calculated from radiosonde data. Surface and tropospheric radiation budgets are derived from upper air temperature and humidity profiles and cloudiness information. The effect of overlapping cloud layers is included. Rainfall is estimated from the island stations. Sensible and latent heat fluxes across the ocean surface are computed by the bulk aerodynamic method. Dissert. Abstr.

N74-16000 Iowa State Univ. of Science and Technology, Ames.
GENERATION AND PROPAGATION OF ELECTROMAGNETIC WAVES IN THE MAGNETOSPHERE Ph.D. Thesis
William Walter Taylor 1973 140 p
Avail: Univ. Microfilms Order No. 73-30992

Broadband ELF, VLF, and LF emissions in the magnetosphere were calculated assuming incoherent Cerenkov radiation from magnetospheric electrons with energies from 50 eV to 50 keV. Calculations were included to determine the ray paths of the emitted waves. A diffusive equilibrium model of the magnetosphere with an ionosphere, plasmapause, and a centered dipole magnetic field was used. Ray path calculations were done in three dimensions. Using simultaneous energetic electron and VLF data, comparisons were made between calculated and observed VLF hiss. It seems unlikely that VLF hiss is produced by incoherent Cerenkov radiation. However, for V-shaped VLF hiss to have its characteristic spectral shape, the emitting region must be small. Calculated spectral densities of incoherent Cerenkov radiation from this small region are orders of magnitude below observed spectral densities. Dissert. Abstr.

N74-16001 Denver Univ., Colo.
INTERPLANETARY FIELDS AND PLASMA: THEIR TERRESTRIAL EFFECTS ON GEOMAGNETIC STORMS Ph.D. Thesis
Michael J. Wiskerchen 1973 101 p
Avail: Univ. Microfilms Order No. 73-28538

An investigation was made into the relationship between large geomagnetic storms and the near earth interplanetary medium. A total of 25 magnetic storm events were selected, from which, detailed comparisons were made between the interplanetary fields and plasma data from explorer 33 and 35 and the hourly equational Dst field. The results of the study indicate that the interplanetary magnetic field plays a significant role in the development of the main phase of a geomagnetic storm. A negative or decreasing z component of the interplanetary magnetic field was found to be a necessary, but not sufficient condition, for the storm main phase to commence. In addition, the y component variation of the interplanetary magnetic field were shown to correspond to Dst variations during the main phase. The interplanetary electric field components were also considered. Dissert. Abstr.

N74-16002 Wisconsin Univ., Madison.
A DIAGNOSTIC MODEL OF THE ZONALLY AVERAGED CIRCULATION IN ISENTROPIC COORDINATES Ph.D. Thesis
Robert Geary Gallimore, Jr. 1973 320 p
Avail: Univ. Microfilms Order No. 73-20993

A diagnostic-numerical model is developed to investigate the role of thermally forced meridional mass circulations in the maintenance of the mean zonal flow of the circumpolar the maintenance of the mean zonal flow of the circumpolar vortex. The model is based on isentropic zonally averaged equations. The thermal forcing is specified by fixed distributions of zonally averaged diabatic heating for the Northern Hemisphere, and the atmosphere's wave regime is parameterized by a geostrophic model of meridional mass and angular momentum transport. Eddy transports of angular momentum are not included, and a fixed surface potential temperature distribution is assumed. Dissert. Abstr.

N74-16003 Rhode Island Univ., Kingston.
RELATION OF LOWER IONOSPHERE CONDUCTIVITY

PROFILES TO ELF WAVE PROPAGATION AND RESONANCES IN THE EARTH-IONOSPHERE WAVEGUIDE Ph.D. Thesis
Anh Tran 1973 138 p
Avail: Univ. Microfilms Order No. 73-28017

In treating ELF wave propagation in the earth-ionosphere cavity, the flat earth approximation may be derived from the exact equations for the spherical cavity by introducing a second order or Debye approximation for the spherical Hankel functions. An exact evaluation of the spherical Hankel functions is used to study the effects of the flat earth approximation on various propagation and resonance parameters. The Schumann resonance frequencies of the earth-ionosphere cavity at approximately 8, 14, and 20 Hz provide a method for obtaining a world average of the (zero-magnetic field) electrical conductivity down to 40 km altitude. The measured bandwidth or Q of the Schumann resonances is used to extend to ground level the electrical conductivity profiles for the 40 km to 100 km altitude range from the experimentally determined values of the resonance frequencies. Dissert. Abstr.

N74-16004+ Aix-Marseilles Univ. (France). Inst. de Mecanique Statistique de la Turbulence.
LABORATORY RESEARCH ON THE OCEAN-ATMOSPHERE ENERGY EXCHANGE MECHANISMS Final Report [RECHERCHES AU LABORATOIRE SUR LES MECANISMES DES ECHANGES D'ENERGIE OCEANS-ATMOSPHERE]
A. Favre, M. Coantic, P. Bonmarin, and A. Ramamonjiarisoa Dec. 1971 19 p refs
(Contract DGRST-67-0-0937)
Avail: NTIS HC $3.00

Theoretical and experimental research is concerned with mass, momentum, and energy transfers with special regard for small scale physical mechanisms. Currently available theoretical results are detailed. The simulation facility, currently under construction, is a 40 m long wind-wave tunnel. An interfacial turbulent boundary layer is delivered where the following parameters are controllable: air velocity, air temperature and humidity, water velocity, water temperature and purity, temperature and velocity turbulence level, stratification, interfacial motions, and parasitic boundary layer in the test section. Using the 1/5 scale model, experiments on instrumental methods are detailed together with a study of wind wave statistical properties. ESRO

N74-16005*# Servicio Geologico de Bolivia, La Paz.
TECTONICS SUBPROGRAM: STRUCTURAL GEOLOGY OF THE NORTHERN PLATEAU OF BOLIVIA (SOUTH OF PERU AND NORTH OF CHILE) [SUB-PROGRAMA TECTONOFISICA: GEOLOGIA ESTRUCTURAL DEL ALTIPLANO NORTE DE BOLIVIA (SUR DEL PERU Y NORTE DE CHILE)]
C. E. Brockmann, Principal Investigator and Claude Martinez 13 Dec. 1973 13 p In SPANISH Sponsored by NASA ERTS
(E74-10212; NASA-CR-136394) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N74-16006*# Naval Research Lab., Washington, D.C.
TERRAIN PROPERTIES AND TOPOGRAPHY FROM SKYLAB ALTIMETRY Monthly Progress Report, Dec. 1973
Allan Shapiro, Principal Investigator 28 Jan. 1974 6 p EREP (NASA Order T-4716-B)
(E74-10219; NASA-CR-136482) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N74-16007*# Indiana Geological Survey, Bloomington. Coal Section.
APPLICATION OF ERTS-1 IMAGERY TO FRACTURE RELATED MINE SAFETY HAZARDS IN THE COAL MINING INDUSTRY Progress Report, 1 Jul. 1973 - 1 Jan. 1974
Charles E. Wier, Frank J. Wobber, Principal Investigators, Orville R. Russell, Roger V. Amato, and Thomas V. Leshendok Jan. 1974 27 p ref Prepared in cooperation with Earth Satellite Corp., Washington, D. C. ERTS
(Contract NAS5-21795)
(E74-10238; NASA-CR-136536) Avail: NTIS HC $3.50 CSCL 08I

The author has identified the following significant results. New fracture detail of Indiana has been observed and mapped from ERTS-1 imagery. Studies so far indicate a close relationship between the directions of fracture traces mapped from the imagery, fractures measured on bedrock outcrops, and fractures measured in the underground mines. First hand observations and discussions with underground mine operators indicate good correlation of mine hazard maps prepared from ERTS-1/aircraft imagery and actual roof falls. The inventory of refuse piles/slurry ponds of the coal field of Indiana has identified over 225 such sites from past mining operations. These data will serve the State Legislature in making tax decisions on coal mining which take on increased importance because of the energy crisis.

N74-16008*# Arizona Univ., Tucson. Dept. of Biological Sciences.
STUDY OF THE MARINE ENVIRONMENT OF THE NORTHERN GULF OF CALIFORNIA Final Report, 21 Jun. 1972 - 19 Sep. 1973
John R. Hendrickson, Principal Investigator 19 Oct. 1973 128 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21777)
(E74-10246; NASA-CR-136544) Avail: NTIS HC $8.50 CSCL 08A

The author has identified the following significant results. Results of studies of the oceanography of the northern Gulf of California (Mexico) are reported. A remote, instrumented buoy measuring and telemetering oceanographic data by ERTS-1 satellite was designed, constructed, deployed, and tested. Regular cruises by a research ship on a pattern of 47 oceanographic stations collected data which are analyzed and referenced to analysis of ERTS-1 satellite imagery. A thermal dynamic model of current patterns in the northern Gulf of California is proposed. Findings are examined in relation to the model.

N74-16009*# Earth Satellite Corp., Washington, D.C.
APPLICATION OF ERTS-1 DATA TO THE PROTECTION AND MANAGEMENT OF NEW JERSEY'S COASTAL ENVIRONMENT Progress Report, 1 Jul. - 31 Dec. 1973
Roland S. Yunghans, Principal Investigator, Edward B. Feinberg, Jo Ann Stitt, Robert L. Mairs, Robert T. Macomber, Dennis Stanczuk, and Frank J. Wobber Jan. 1974 56 p refs Prepared for N. J. Dept. of Environ. Protection Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21765)
(E74-10247; NASA-CR-136545) Avail: NTIS HC $5.00 CSCL 08C

The author has identified the following significant results. The principal thrust of this ERTS-1 experiment is to develop quasi-operational information products from analysis of ERTS-1 imagery and collateral aerial photography and to apply these products to the practical regulation, protection, and management of New Jersey's coastal environment. Incorporated into this goal is the development of procedures for the operational use of ERTS-1 data products within New Jersey's Department of Environmental Protection. Analysis and product preparation for operational needs has centered on four major coastal resource problem areas: detection of land use changes in the coastal zone; siting of ocean outfalls; monitoring of offshore waste disposal; and calculation of recession rates along the Atlantic Shore. The relative utility and estimated monetary benefits derived from ERTS and aircraft imagery for each problem area have been determined. Of equal importance is the development to a capability within the State to use and understand remote sensor-derived information, and the application of this information to meet the requirements of current and anticipated coastal zone legislation.

N74-16010*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PLANNING APPLICATIONS IN EAST CENTRAL FLORIDA Progress Report, 1 Dec. 1973 - 31 Jan. 1974

John W. Hannah, Garland L. Thomas, and Ferd Esparza, Principal Investigators 31 Jan. 1974 8 p Prepared in cooperation with Brevard County Planning Dept., Titusville, Fla. ERTS
(Contract NAS5-21847)
(E74-10248; NASA-TM-X-69380) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N74-16011*# Ohio Dept. of Economic and Community Development, Columbus.
RELEVANCE OF ERTS-1 TO THE STATE OF OHIO Semiannual Progress Report, 1 Jul. - 31 Dec. 1973
David C. Sweet, Paul G. Pincura, and George E. Wukelic, Principal Investigators 11 Jan. 1974 45 p Prepared in cooperation with Battelle Columbus Labs., Ohio Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21782)
(E74-10250; NASA-CR-136564; SAPR-3) Avail: NTIS HC $4.25 CSCL 08F

The author has identified the following significant results. During the first year of project effort the ability of ERTS-1 imagery to be used for mapping and inventorying strip-mined areas in south eastern Ohio, the potential of using ERTS-1 imagery in water quality and coastal zone management in the Lake Erie region, and the extent that ERTS-1 imagery could contribute to localized (metropolitan/urban), multicounty, and overall state land use needs were experimentally demonstrated and reported as significant project results. Significant research accomplishments were achieved in the technological development of manual and computerized methods to extract multi-feature information as well as singular feature information from ERTS-1 data as is exemplified by the forestry transparency overlay. Fabrication of an image transfer device to superimpose ERTS-1 data onto existing maps and other data sources was also a significant analytical accomplishment.

N74-16012*# Stanford Univ., Calif. School of Earth Sciences.
STRUCTURAL AND LITHOLOGIC STUDY OF NORTHERN CALIFORNIA COAST RANGE AND SACRAMENTO VALLEY, CALIFORNIA Progress Report, 1 Jul. - 20 Dec. 1973
Ernest I. Rich, Principal Investigator and William Clinton Steele Dec. 1973 30 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21775)
(E74-10251; NASA-CR-136565) Avail: NTIS HC $3.50 CSCL 08E

The author has identified the following significant results. Photgeologic examination of repetitive multispectral ERTS-1 imagery of Northern California has disclosed several systems of linear features which may be important for the interpretation of the structural history of California. They are separated from an orthogonal system of linears in the Klamath Mts. by a set of discontinuous southeast-trending linear features (the Mendocino system) which is traceable from the Pacific Coast, at Cape Mendocino, into the eastern foothills of the Sierra Nevada. Within the Sierra Nevada, the Mendocino system separates the north-trending Sierran system from a set of linears characteristic of the Modoc Plateau. With minor exception, little overlap exists among the systems which suggests a decipherable chronology and evolutionary history for the region. The San Andres system of linears appears to truncate or co-exist with most of the other systems in the northern Coast Ranges. The Mendocino system truncates the Klamath, Sierran, and Modoc systems. The Sierran system may represent fundamental and long-persisting pre-late Paleozoic zones of crustal weakness which have been reactivated from time to time. The Mendocino system was possibly developed in early Mesozoic and is important to the structural framework of Northern California.

N74-16013*# Geological Survey, Reston, Va. Geographic Applications Program.
URBAN AND REGIONAL LAND USE ANALYSIS: CARETS AND CENSUS CITIES EXPERIMENT PACKAGE Monthly Progress Report, Nov. 1973
Robert H. Alexander, Principal Investigator and Valerie Milazzo 20 Nov. 1973 4 p refs EREP
(NASA Order T-5290-B)
(E74-10252; NASA-CR-136566) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. Areas of post 1970 and 1972 land use changes were identified solely from the Skylab imagery from comparisons with 1970 land use maps. Most land use changes identified involved transition from agriculture to single family residential land use. The second most prominent changes identified from the Skylab imagery were areas presently under construction. Post 1970 changes from Skylab were compared with the 1972 changes noted from the high altitude photographs. A good correlation existed between the change polygons mapped from Skylab and those mapped from the 1972 high altitude aerial photos. In addition, there were a number of instances where additional built-up land use not noted in the 1972 aerial photo as being developed were identified on the Skylab imagery. While these cases have not been documented by field observation, by correlating these areas with the appearance of similar land use areas whose identity has been determined, we can safely say that we have been able to map further occurrences of land use change beyond existing high altitude photo coverage from the Skylab imagery. It was concluded that Skylab data can be used to detect areas of land use change within an urban setting.

N74-16014*# Michigan State Univ., East Lansing.
INVESTIGATION OF SKYLAB DATA Monthly Plans and Progress Report, Dec. 1973
Lester V. Manderscheid, Principal Investigator Dec. 1973 3 p EREP
(Contract NAS9-13332)
(E74-10253; NASA-CR-136567) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N74-16015*# Kansas Univ. Center for Research, Inc., Lawrence. Space Technology Center.
DETECTION OF MOISTURE AND MOISTURE RELATED PHENOMENA FROM SKYLAB Monthly Progress Report, Jan. 1974
Joe R. Eagleman, Ernest C. Pogge, Richard K. Moore, Principal Investigators, Norman Hardy, Wen Lin, and Larry League Jan. 1974 31 p refs EREP
(Contract NAS9-13273)
(E74-10254; NASA-CR-136582) Avail: NTIS HC $3.75 CSCL 08H

The author has identified the following significant results. Skylab 2 data for June 5, 1973 (Texas site) relates favorably with previously calculated aircraft data when correlating brightness temperature to soil moisture. However, more detailed work is needed to determine the corrected surface temperature. In addition, correlations between the S194 antenna temperature and soil moisture have been obtained for five sets of Skylab data. The best correlations were obtained for the surface to one inch depth in four cases and for surface to two inches depth for the fifth case. Correlation coefficients for the surface to one inch depth were -0.98, -0.95, -0.90, -0.82, and -0.80.

N74-16016*# Colorado School of Mines, Golden. Dept. of Geology.
GEOLOGIC AND MINERAL AND WATER RESOURCES INVESTIGATIONS IN WESTERN COLORADO Progress Report, 1 Dec. 1973 - 31 Jan. 1974
Daniel H. Knepper, Jr., Principal Investigator 30 Jan. 1974 3 p ERTS
(Contract NAS5-21778)
(E74-10255; NASA-CR-136583) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N74-16017*# Arizona Univ., Tucson.
A STUDY TO EXPLORE THE USE OF REMOTE SENSING TO DETERMINE NATIVE ARID PLANT DISTRIBUTION Progress Report, period ending 15 Dec. 1973

William G. McGinnies, Principal Investigator 15 Dec. 1973 3 p ERTS
(Contract NAS5-21812)
(E74-10256; NASA-CR-136584) Avail: NTIS HC $3.00 CSCL 08F

There are no author-identified significant results in this report.

N74-16018*# Texas Technological Univ., Lubbock. Remote Sensing Lab.
DYNAMICS OF PLAYA LAKES IN THE TEXAS HIGH PLAINS Progress Report, 1 Dec. 1973 - 31 Jan. 1974
C. C. Reeves, Jr., Principal Investigator 31 Jan. 1974 2 p ERTS
(Contract NAS5-21720)
(E74-10257; NASA-CR-136585) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N74-16019*# Indiana Geological Survey, Bloomington.
APPLICATION OF EREP IMAGERY TO FRACTURE-RELATED MINE SAFETY HAZARDS AND ENVIRONMENTAL PROBLEMS IN MINING Quarterly Progress Report, 20 Oct. 1973 - 20 Jan. 1974
Charles E. Wier, Frank J. Wobber, Roger V. Amato, and Orville R. Russell, Principal Investigators 22 Jan. 1974 14 p ref Prepared in cooperation with Earth Satellite Corp., Washington, D. C. Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS9-13358)
(E74-10258; NASA-CR-136586; QPR-3) Avail: NTIS HC $3.00 CSCL 08I

The author has identified the following significant results. All Skylab 2 imagery received to date has been analyzed manually and data related to fracture analysis and mined land inventories has been summarized on map-overlays. A comparison of the relative utility of the Skylab image products for fracture detection, soil tone/vegetation contrast mapping, and mined land mapping has been completed. Numerous fracture traces were detected on both color and black and white transparencies. Unique fracture trace data which will contribute to the investigator's mining hazards analysis were noted on the EREP imagery; these data could not be detected on ERTS-1 imagery or high altitude aircraft color infrared photography. Stream segments controlled by fractures or joint systems could be identified in more detail than with ERTS-1 imagery of comparable scale. ERTS-1 mine hazards products will be modified to demonstrate the value of this additional data. Skylab images were used successfully to update a mined land map of Indiana made in 1972. Changes in mined area as small as two acres can be identified. As the Energy Crisis increases the demand for coal, such demonstrations of the application of Skylab data to coal resources will take on new importance.

N74-16020*# Cornell Univ., Ithaca, N.Y. Resource Information Lab.
PHOTOGRAPHIC ENHANCEMENT OF ERTS IMAGERY Progress Report
Ernest E. Hardy, Principal Investigator and E. S. Phillips 15 Jan. 1974 44 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21886)
(E74-10259; NASA-CR-136587) Avail: NTIS HC $4.25 CSCL 05B

There are no author-identified significant results in this report.

N74-16021*# Bureau of Sport Fisheries and Wildlife, Jamestown, N.D. Northern Prairie Wildlife Research Center.
UTILIZATION OF SKYLAB (EREP) SYSTEM FOR APPRAISING CHANGES IN CONTINENTAL MIGRATORY BIRD HABITAT Monthly Progress Report, Jan. 1974
Harvey K. Nelson, Principal Investigator Jan. 1974 2 p EREP
(NASA Order T-4114-B)
(E74-10260; NASA-CR-136590) Avail: NTIS HC $3.00 CSCL 06C

There are no author-identified significant results in this report.

N74-16022*# Army Construction Engineering Research Lab., Champaign, Ill.
EFFECTS OF CONSTRUCTION AND STAGED FILLING OF RESERVOIRS ON THE ENVIRONMENT AND ECOLOGY Progress Report, 9 Dec. 1973 - 8 Feb. 1974
Ravinder K. Jain, Principal Investigator 8 Feb. 1974 2 p ERTS
(NASA Order S-70255-AG)
(E74-10261; NASA-CR-136614) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N74-16023*# Environmental Research Inst. of Michigan, Ann Arbor.
DEVELOPING PROCESSING TECHNIQUES FOR SKYLAB DATA Monthly Progress Report, Jan. 1974
Richard F. Nalepka and William A. Malila, Principal Investigators 6 Feb. 1974 2 p EREP
(Contract NAS9-13280)
(E74-10262; NASA-CR-136684; ERIM-101900-23-L; MPR-11) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N74-16024*# National Marine Fisheries Service, Bay Saint Louis, Miss.
APPLICATION OF REMOTE SENSING FOR FISHERY RESOURCE ASSESSMENT AND MONITORING Monthly Progress Report, 10 Jan. - 10 Feb. 1974
William H. Stevenson, Principal Investigator 8 Feb. 1974 4 p EREP
(NASA Order T-8217-B)
(E74-10263; NASA-CR-136648; MPR-9) Avail: NTIS HC $3.00 CSCL 08A

There are no author-identified significant results in this report.

N74-16025*# New York State Museum and Science Service, Albany.
ANALYSIS OF ERTS-1 LINEAR FEATURES IN NEW YORK STATE Progress Report, Jun. 1973 - Jan. 1974
Yngvar W. Isachsen, Principal Investigator, Robert H. Fakundiny, and Stephen W. Forster 14 Feb. 1974 73 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21764)
(E74-10264; NASA-CR-136650) Avail: NTIS HC $5.75 CSCL 08G

The author has identified the following significant results. All ERTS-1 linears confirmed to date have topographic expression although they may appear as featureless tonal linears on the imgery. A bias is unavoidably introduced against any linears which may parallel raster lines, lithological trends, or the azimuth of solar illumination. Ground study of ERTS-1 topographic lineaments in the Adirondacks indicates: outcrops along linears are even more rare than expected, fault breccias are found along some NNE lineaments, chloritization and slickensiding without brecciation characterize one EW lineament whereas closely-spaced jointing plus a zone of plastic shear define another. Field work in the Catskills suggests that the prominent new NNE lineaments may be surface manifestations of normal faulting in the basement, and that it may become possible to map major joint sets over extensive plateau regions directly on the imagery. Fall and winter images each display some unique linears, and long linears on the fall image commonly appear as aligned segments on the winter scene. A computer-processed color composite image permitted the extraction or additional information on the shaded side of mountains.

N74-16026*# Arizona Univ., Tucson.
EVALUATION OF ERTS-1 IMAGE SENSOR SPATIAL

RESOLUTION IN PHOTOGRAPHIC FORM Process Report, 1 Nov. 1973 - 1 Jan. 1974
P. N. Slatter, Principal Investigator, R. L. Antos, and R. A. Schowengerdt Dec. 1973 13 p ERTS
(Contract NAS5-21849)
(E74-10277; NASA-CR-136663; PR-8) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N74-16027*# Argus Exploration Co., Los Angeles, Calif.
STRUCTURAL LINEAMENTS IN THE SOUTHERN SIERRA NEVADA, CALIFORNIA
Mark A. Liggett, Principal Investigator and John F. Childs Feb. 1974 11 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198 ERTS
(Contract NAS5-21809)
(E74-10279; NASA-CR-136665) Avail: NTIS HC $3.00 CSCL 08G

The author has identified the following significant results. Several lineaments observed in ERTS-1 MSS imagery over the southern Sierra Nevada of California have been studied in the field in an attempt to explain their geologic origins and significance. The lineaments are expressed topographically as alignments of linear valleys, elongate ridges, breaks in slope or combinations of these. Natural outcrop exposures along them are characteristically poor. Two lineaments were found to align with foliated metamorphic roof pendants and screens within granitic country rocks. Along other lineaments, the most consistant correlations were found to be alignments of diabase dikes of Cretaceous age, and younger cataclastic shear zones and minor faults. The location of several Pliocene and Pleistocene volcanic centers at or near lineament intersections suggests that the lineaments may represent zones of crustal weakness which have provided conduits for rising magma.

N74-16028*# Stanford Univ., Calif. Dept. of Applied Earth Sciences.
FEASIBILITY OF USING S-191 INFRARED SPECTRA FOR GEOLOGICAL STUDIES FROM SPACE Monthly Reports, Dec. 1973 and Jan. 1974
R. J. P. Lyon and F. R. Honey, Principal Investigators 31 Jan. 1974 3 p EREP
(Contract NAS9-13357)
(E74-10285; NASA-CR-136671) Avail: NTIS HC $3.00 CSCL 08G

There are no author-identified significant results in this report.

N74-16029*# National Environmental Satellite Service, Washington, D.C.
EVALUATION OF ERTS DATA FOR CERTAIN OCEANOGRAPHIC USES Bimonthly Report, Nov. - Dec. 1973
Alan E. Strong, Principal Investigator Dec. 1973 3 p ERTS (NASA Order S-70246-AG)
(E74-10287; NASA-CR-136673) Avail: NTIS HC $3.00 CSCL 08H

The author has identified the following significant results. Upwelling along the eastern shore of Lake Michigan was occurring during the 3 and 21 August 1973 visits by ERTS-1. The NOAA-2 VHRR thermal-IR data are being digitized for comparison. Early indications are that these upwellings induced a calcium carbonate precipitate to form in the surface waters. It is most pronounced in the MSS-4 channel. On the lake bottom this jell-like sediment is known as marl and adds to the eutrophication of the lake. This phenomenon may help to explain the varve-like nature of bottom cores that have been observed in the Great Lakes.

N74-16030*# Alaska Univ., Palmer.
IDENTIFICATION OF PHENOLOGICAL STAGES AND VEGETATIVE TYPES FOR LAND USE CLASSIFICATION Bimonthly Progress Report
Jay D. McKendrick, Principal Investigator 6 Feb. 1974 17 p refs ERTS
(Contract NAS5-21833)
(E74-10290; NASA-CR-136677; MPR-9) Avail: NTIS HC $3.00 CSCL 02F

The author has identified the following significant results. Recent signature identification and refinement techniques indicate that with automated classification of MSS CCT data commercial stands of cottonwood and white spruce can be identified with 80% accuracy in the Bonanza Creek experimental forest. Since that forest is representative of the vast interior Alaska forests, this finding has substantial economic importance to public and private forestry interests in Alaska.

N74-16031*# Massachusetts Inst. of Tech., Cambridge. Measurement Systems Lab.
A SIMPLIFIED MODEL FOR THE GRAVITATIONAL POTENTIAL OF THE ATMOSPHERE AND ITS EFFECT ON THE GEOID Final Report
Stephen J. Madden, Jr. Jun. 1972 17 p refs
(Grant NGR-22-009-673)
(NASA-CR-132918; RE-84) Avail: NTIS HC $3.00 CSCL 20J

The earth's atmosphere is considered as made up of oblate spheroidal layers of variable density lying over an oblate spheroidal earth. The gravitational attraction of the atmosphere at exterior points is computed and its contribution to the usual spherical harmonic gravitational expansion is assessed. The potential is also found for points at the bottom of the model atmosphere. This latter result is of interest for determination of the potential at the surface of the geoid. The atmospheric correction to the geoid determination from satellite coefficients is given. Author

N74-16032*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
A STUDY OF THE ORIGIN, NATURE, AND BEHAVIOR OF PARTICULATE MATTER AND METALLIC ATOMS IN THE MESOSPHERE, LOWER THERMOSPHERE, AND AT THE MESOPAUSE Final Report
Sherman K. Poultney 30 Sep. 1973 30 p refs
(Grant NGR-21-002-219)
(NASA-CR-136783) Avail: NTIS HC $3.50 CSCL 04A

In a study of particulate matter and metallic atoms in the vicinity of the mesopause, three areas have received the most effort. These areas are: the significance of cometary dust influxes to the earth's atmosphere; the relation of nightglows to atmospheric motions and aerosols; and the feasibility of using an airborne resonant scatter lidar to study polar noctilucent clouds, the sodium layer, and fireball dust. Author

N74-16033# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
ASTROGEODETIC OBSERVATIONS DURING 1966 AT THE MAIN TRIANGLE POINTS BAD HONNEF, MAHLBERG, DALLDORF AND NIEDERREIFENBERG [ASTRONOMISCH-GEODAETISCHE BEOBACHTUNGEN 1966 AUF DEN HAUPTDREIECKSPUNKTEN BAD HONNEF, MAHLBERG, DALLDORF UND NIEDERREIFENBERG]
Karl-Wilhelm Schrick 1973 21 p refs In GERMAN; ENGLISH summary
(Rept-146) Avail: NTIS HC $3.25

Longitude, latitude, and azimuth were determined by means of a transit instrument at the Laplace stations of Bad Honnef, Mahlberg and Dalldorf (at Dalldorf only longitude and latitude). Niederreifenberg was the reference station for time determinations. At Niederreifenberg the latitude, too, was determined. Data are given for: (a) finding the time from instances of meridian star transits (b) finding latitude by the differences of zenith angles in the meridian according to the method of Horrebrow-Talcott, and (c) finding the azimuth from instants of star transits in the azimuth of the remote station. The motion of the pole was also considered. Author

N74-16034# Physical Research Lab., Ahmedabad (India).
LONGITUDINAL EXTENT OF THE COUNTER-ELECTROJET
R. P. Kane [1973] 9 p refs
(AER-73-08) Avail: NTIS HC $3.00

A study of the phenomenon of counter-electrojet (observed as an afternoon depression in the H component of geomagnetic field at equator) at different longitudes reveals that its longitudinal extent is very restricted, though the phenomenon may recur in the same location for several days. This suggests the possibility

of short-lived equatorial wind typhoons at ionospheric heights, similar to those on ground. Author

N74-16035# Ionospharen-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING FREIBURG, URSI-CODE 31, OCTOBER 1973 [IONOSPHAEREN-DATEN, VERTIKAL-ECHO-LOTUNG: FREIBURG, URSI-CODE 31, OKTOBER 1973]
Oct. 1973 44 p In ENGLISH and GERMAN
(Rept-328-F) Avail: NTIS HC $4.25

Wave critical frequencies for the F-2, F-1, and E region as measured by vertical echo sounding, are presented in tables. E.H.W.

N74-16036*# Michigan State Univ., East Lansing.
UPPER KALAMAZOO WATERSHED LAND COVER INVENTORY
Benjamin Richason, III and William Enslin Oct. 1973 42 p (Grant NGL-23-004-083)
(NASA-CR-136621) Avail: NTIS HC $4.25 CSCL 08H

Approximately 1000 square miles of the eastern portion of the watershed were inventoried based on remote sensing imagery. The classification scheme, imagery and interpretation procedures, and a cost analysis are discussed. The distributions of land cover within the area are tabulated. F.O.S.

N74-16037# Joint Publications Research Service, Arlington, Va.
METEOROLOGY AND HYDROLOGY, NO. 10, 1973
10 Jan. 1974 160 p refs Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 3-62, 73-81, 87-103, 110-122
(JPRS-60954) Avail: NTIS HC $10.00

Hydrological management aspects for conservation of water resources and water quality in the U.S.S.R. are considered. For individual titles, see N74-16038 through N74-16048.

N74-16038 Joint Publications Research Service, Arlington, Va.
THE ALL-UNION HYDROLOGIC CONGRESSES
A. A. Sokolov *In its* Meteorology and Hydrol., no. 10, 1973 (JPRS-60954) Jan. 1974 p 1-9 Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 3-8 (For availability see N74-16037 07-13)

A brief survey on a comprehensive study of water resources in the U.S.S.R. is reported. The practical utilization of the results of hydrologic research in the national economy is noted. G.G.

N74-16039 Joint Publications Research Service, Arlington, Va.
PROBLEM OF THE EFFICIENT UTILIZATION AND CONSERVATION OF WATER RESOURCES AND THE GOALS OF HYDROLOGY
V. I. Korzun and A. A. Sokolov *In its* Meteorology and Hydrol., no. 10, 1973 (JPRS-60954) 10 Jan. 1974 p 10-21 Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 9-17 (For availability see N74-16037 07-13)

Hydrological aspects of efficient utilization and conservation of water resources in the U.S.S.R. are discussed. Considered are: (1) Redistribution of water resources among wet and dry regions; (2) natural water pollution and its effects; (3) improvement of irrigation and drainage methods; (4) water erosion control; (5) hydrological calculations and forecasting; and (6) theoretical and experimental water balance research. G.G.

N74-16040 Joint Publications Research Service, Arlington, Va.
STATE SYSTEM OF INVENTORYING WATER AND ITS USAGE AND HYDROLOGIC CALCULATIONS AND FORECASTING
S. K. Cherkavskiy *In its* Meteorology and Hydrol., no. 10, 1973 (JPRS-60954) 10 Jan. 1974 p 22-35 Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 18-26 (For availability see N74-16037 07-13)

The organizational and technical principles of the state system for inventorying water and its utilization by a system of information gathering and processing for compiling the U.S.S.R. state water cadaster are disucssed. Author

N74-16041 Joint Publications Research Service, Arlington, Va.
PROBLEM OF EVALUATING THE EFFECT OF HUMAN ACTIVITY ON SURFACE WATER RESERVES
I. A. Shiklomanov *In its* Meteorology and Hydrol., no. 10, 1973 (JPRS-60954) 10 Jan. 1974 p 36-51 refs Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 27-36 (For availability see N74-16037 07-13)

The problems of evaluating the variation in river runoff under the effects of the economic activity of man and, above all, the irrigated land and channel regulation are considered. Author

N74-16042 Joint Publications Research Service, Arlington, Va.
HYDROLOGIC FORECAST AND WATER CONSERVATION
Ye. G. Popov and V. D. Komarov *In its* Meteorology and Hydrol., no. 10, 1973 (JPRS-60954) 10 Jan. 1974 p 52-63 refs Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 37-44 (For availability see N74-16037 07-13)

The value and practical utilization of hydrologic forecasts for water conservation in the U.S.S.R. was assessed. A brief investigation was performed of the methods of compiling the forecasts, and the most important problems and areas of research in the field of hydrologic forecasting. Author

N74-16043 Joint Publications Research Service, Arlington, Va.
HYDROLOGY AND STRUCTURAL PLANNING AND DESIGN
A. I. Chebotarev and B. I. Serpik *In its* Meteorology and Hydrol., no. 10, 1973 (JPRS-60954) 10 Jan. 1974 p 64-79 refs Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 45-54 (For availability see N74-16037 07-13)

A brief discussion of the Instructions for determining the Calculated Hydrologic Characteristics SN (Construction Standards) 435-72 is presented. The errors permitted in preparing some of the normative documents are noted, and the primary problems are indicated, the resolution of which should promote improvement of the technical standardization in the field of calculating river runoff as applied to the requirements of structural design practice. Author

N74-16044 Joint Publications Research Service, Arlington, Va.
AREAS AND PROBLEMS OF STUDYING THE FLUCTUATIONS OF RIVER RUNOFF OVER MANY YEARS
S. N. Kritskiy, M. F. Menkel, and D. Ya. Ratkovich *In its* Meteorology and Hydrol., no. 10, 1973 (JPRS-60954) 10 Jan. 1974 p 80-91 refs Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 55-62 (For availability see N74-16037 07-13)

The modern state of science is considered in the field of prediction and description of the fluctuations of the river runoff as applied to the problems of engineering hydrology. The basic problems of future research are being formulated. Author

N74-16045 Joint Publications Research Service, Arlington, Va.
URGENT PROBLEMS OF STUDYING THE QUALITY OF SURFACE WATER
A. V. Karaushev and B. G. Skakalskiy *In its* Meteorology and Hydrol., no. 10, 1973 (JPRS-60954) 10 Jan. 1974 p 92-105 refs Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 73-81 (For availability see N74-16037 07-13)

The modern state of research is considered in connection with the quality characteristics of surface water in the U.S.S.R. and evaluation of the variation of water quality in rivers, lakes, and reservoirs as a result of human activity. Primary attention has been given to the problems occurring in connection with the necessity for regulating the water quality and the controlling pollution. A detailed study was made of the problems pertaining to the development of methods of calculating the variation of the water quality as a function of the influx of waste water and also as a function of hydrodynamic and hydrologic conditions. Author

N74-16046 Joint Publications Research Service, Arlington, Va.
UTILIZATION OF SATELLITE INFORMATION FOR HYDROLOGIC PURPOSES
V. V. Kupriyanov and V. G. Prokacheva *In its* Meteorology and Hydrol., no. 10, 1973 (JPRS-60954) 10 Jan. 1974 p 106-115 refs Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 87-93 (For availability see N74-16037 07-13)

The possibilities of using information coming from artificial satellites for hydrologic purposes are considered. Examples are

presented of decoding the television pictures from artificial satellites to study the snow cover, the ice situation in lakes, and hydrographic features. Prospects for the development of methods of decoding the television images from artificial satellites for the solution of problems connected with evaluating water resources, water regime and quality are evaluated. Author

N74-16047 Joint Publications Research Service, Arlington, Va.
MODERN CONDITIONS AND FUTURE OF SEVAN LAKE
G. G. Varbumyan *In its* Meteorology and Hydrol., no. 10, 1973 (JPRS-60954) 10 Jan. 1974 p 116-132 refs Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 94-103 (For availability see N74-16037 07-13)

The water balance under natural conditions and with passage of the secular water storage of lake Sevan during the 1927-1971 period are presented. Information about using the secular water storage of lake Sevan for hydroelectric power and irrigation and physical-chemical and biological regimes in connection with lowering the lake level are discussed. In order to conserve and raise the level of the lake, sources of water are indicated for regulation in the transfer of runoff to lake Sevan. The water balance of lake Sevan is forecast for the period 1972-2000. Author

N74-16048 Joint Publications Research Service, Arlington, Va.
INTERNATIONAL COOPERATION OF HYDROLOGISTS
A. G. Kovzel *In its* Meteorology and Hydrol., no. 10, 1973 (JPRS-60954) 10 Jan. 1974 p 133-152 refs Transl. into ENGLISH from Meteorol. Gidrolog. (Moscow), no. 10, 1973 p 110-122 (For availability see N74-16037 07-13)

The international cooperation of hydrologists is discussed in accordance with the program and goals of the International Hydrologic Decade, the station network of the International Hydrologic Decade of the U.S.S.R. and the world. Research with respect to the International Hydrologic Decade program relates to the field of water balance and floodings of representative and experimental basins. Author

N74-16049# Geological Survey, Washington, D.C.
CLASSIFICATION OF PUBLIC LANDS VALUABLE FOR GEOTHERMAL STEAM AND ASSOCIATED GEOTHERMAL RESOURCES
L. H. Godwin, L. B. Haigler, R. L. Rioux, D. E. White, L. J. P. Muffler, and R. G. Wayland 1971 21 p refs
(CIRC-647) Avail: NTIS HC $3.25

The classification standards for determining which Federal lands are classifiable as geothermal steam and associated geothermal resources lands under the Geothermal Steam Act of 1970 (84 Stat. 1566) are presented. The concept of a geothermal resources province is established for classification of lands for the purpose of retention in Federal ownership of rights to geothermal resources upon disposal of Federal lands. A geothermal resources province is defined as an area in which higher than normal temperatures are likely to occur with depth and in which there is a reasonable possibility of finding reservoir rocks that will yield steam or heated fluids to wells. The determination of a known geothermal resources area is made after careful evaluation of the available geologic, geochemical, and geophysical data and any evidence derived from nearby discoveries, competitive interests, and other indicia. Author

N74-16050*# Scientific Translation Service, Santa Barbara, Calif.
PROBLEMS OF SPACE BIOLOGY. VOLUME 18: THE EFFECT OF CERTAIN SPACE AND GEOPHYSICAL FACTORS ON THE BIOSPHERE OF THE EARTH
V. N. Chernigovskiy, ed. Washington NASA Dec. 1973 246 p refs Transl. into ENGLISH of the publ. "Problemy Kosmicheskoy Biologii. Tom 18: Vliyaniye Nekotorykh Kosmicheskikh i Geofizicheskikh Faktorov na Biosfery Zemli" Moscow, Nauka, 1973 p 1-208
(Contract NASw-2483)
(NASA-TT-F-15158) Avail: NTIS HC $14.50 CSCL 04/1

The problems of the biological effect of heliophysical factors and magnetic fields, as well as their importance in the biosphere, are discussed. Author

N74-16051# National Physical Lab., New Delhi (India). Radio Science Div.
D REGION DURING SOLAR ECLIPSES
D. K. Chakrabarty and A. P. Mitra May 1973 25 p refs
(RSD-80) Avail: NTIS HC $3.25

Representative profiles are given of electron and positive and negative ion concentrations during solar eclipses. An ion chemical scheme is presented that satisfactorily explains the observed changes in these concentrations for the solar eclipses of March 7, 1970, November 12, 1966, and May 20, 1966 which occurred over Wallops Island, Brazil, and Greece respectively. It was found that a mere change of the ionizing radiation during solar eclipses can explain the observed variations in all their aspects above 80 km. Below 80 km, a satisfactory explanation of only the positive ion density is possible. To explain the severe decrease in electron density and the increase in effective recombination coefficient below 80 km, a decrease in the detachment rate of electrons from heavy negative ions from a pre-eclipse value of 2 x .01 1/5 less gradually to about zero at totality is necessary. Author

N74-16052# National Physical Lab., New Delhi (India). Radio Science Div.
THEORETICAL MODELS OF D-REGION ELECTRON DENSITY PROFILES
D. K. Chakrabarty and A. P. Mitra Apr. 1973 16 p refs
(RSD-78) Avail: NTIS HC $3.00

Theoretical models of D-region electron density profiles are presented for the following conditions. (1) Low latitude station (10 degrees) and for solar minimum (F sub 10.7 equals 70 units) and maximum (F sub 10.7 equals 200 units) conditions. (2) Middle latitude station (40 degrees) and for solar minimum (F sub 10.7 equals 70 units) and maximum (F sub 10.7 cm equals 200 units) conditions. These models have been built on the basis of a suitable ion-chemical scheme and are given in tabular form from 0000 to 2400 hrs local time at intervals of half hour. Author

N74-16053# National Physical Lab., New Delhi (India). Radio Science Div.
NEUTRAL WIND VELOCITIES CALCULATED FROM TEMPERATURE MEASUREMENTS DURING A MAGNETIC STORM AND THE OBSERVED IONOSPHERIC EFFECTS
O. P. Saxena and K. K. Mahajan Apr. 1973 19 p refs Presented at COSPAR Meeting, Konstanz, West Germany, 23-25 May 1973
(RSD-79; COSPAR-Paper-f.4) Avail: NTIS HC $3.00

Neutral temperature measurements on the OGO 6 satellite are used to calculate the neutral wind velocities during the magnetic storm of Sept. 27, 1969. The neutral densities required for these calculations are taken from the Jacchia 1971 model and the electron density profiles from the foF2 data, with appropriate modelling above and below the F 2 peak. These velocities, when compared with those calculated for magnetically quiet conditions, indicate that while the wind velocities during the magnetic storm remain relatively unaffected at the low latitudes, they show a significant change at the mid and the high latitudes. The observed ionospheric effects during the storm, which show a large decrease in the F 2 region electron density at the mid and high latitudes and practically no change at the low latitudes, are discussed in relation to the calculated wind velocities. Author

N74-16054# National Physical Lab., New Delhi (India). Radio Science Div.
ESTIMATION OF H(PLUS) FLUXES AT POLAR REGIONS
K. K. Mahajan and V. K. Pandey May 1973 15 p refs
(RSD-81) Avail: NTIS HC $3.00

Alouette-2 electron density profiles to heights of 3000 km are analyzed for low, mid and polar latitudes. The electron scale heights at the low and mid latitudes indicate H(+) to be the dominant ionic constituent for heights above 1000 km. At the polar regions the scale heights are low, indicating dominance of O(+) ions. This situation is in reverse to diffusive equilibrium conditions, where one would expect H(+) to be the major ion at heights above 1000 km and thus this lends support to the theories of H(+) escape at the polar regions. The electron distributions at the mid and high latitudes are used to estimate

the H(+) flow velocity at the polar regions. The calculated velocity is in reasonable agreement with that expected from the polar wind theory. Author

N74-16055*# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Engineering Science and Mechanics.
STATISTICAL ANALYSIS OF LOW LEVEL ATMOSPHERIC TURBULENCE
H. W. Tieleman and W. W. L. Chen Jan. 1974 226 p refs (Grant NGL-47-004-67)
(NASA-CR-137456; VPI-E-74-3) Avail: NTIS HC $13.50 CSCL 04A

The statistical properties of low-level wind-turbulence data were obtained with the model 1080 total vector anemometer and the model 1296 dual split-film anemometer, both manufactured by Thermo Systems Incorporated. The data obtained from the above fast-response probes were compared with the results obtained from a pair of Gill propeller anemometers. The digitized time series representing the three velocity components and the temperature were each divided into a number of blocks, the length of which depended on the lowest frequency of interest and also on the storage capacity of the available computer. A moving-average and differencing high-pass filter was used to remove the trend and the low frequency components in the time series. The calculated results for each of the anemometers used are represented in graphical or tabulated form. Author

N74-16056*# Louisiana State Univ., Baton Rouge. Div. of Engineering Research.
A STUDY OF SEDIMENT TRANSPORT AND EROSION IN THE FOURCHON AREA OF SOUTH LOUISIANA
R. P. Self (Nicholls State Univ.) Dec. 1973 30 p refs (Grant NGL-19-001-105)
(NASA-CR-136676; AOP-3) Avail: NTIS HC $3.50 CSCL 08H

Aerial photography in the form of color infrared and color positive transparencies were used as aids in evaluating the rate and effect of erosion and sediment transport in Bay Champagne, a coastal marshland of Louisiana. Problems were found in the aerial photography method used. Vegetational differences do not always reflect sediment differences. Only areas containing different soils and sediments are easily defined with aerial photography. The shoreline erosion rate is 75 to 100 ft/yr. Areas which are undergoing erosion shift due to changes in wave refraction. In canals and channels with strong currents, erosion also occurs at a rapid rate. It is recommended that drainage patterns be studied carefully before breaches are made as man-made breaches could reverse drainage. S.K.W.

N74-16057# Joint Publications Research Service, Arlington, Va.
COUPLING OF THE UPPER AND LOWER ATMOSPHERE BY INFRARED RADIATION AND THE POSSIBILITY OF FORECASTING PRESSURE VARIATIONS AT SEA LEVEL DURING GEOMAGNETIC DISTURBANCES
B. F. Gordiyets, M. N. Markov, and L. A. Shelepin 30 Jan. 1974 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR, v. 212, no. 2, 1973 p 341-344
(JPRS-61096) Avail: NTIS HC $3.00

A possible mechanism of energy transfer from the upper atmosphere downward into the stratosphere and troposphere is presented. It demonstrated in what way small disturbances caused by the release of this energy can lead to a significant variation of the pressure at sea level. Author

N74-16058*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PROCEDURES MANUAL FOR DETECTION AND LOCATION OF SURFACE WATER USING ERTS-1 MULTISPECTRAL SCANNER DATA. VOLUME 1: SUMMARY
Dec. 1973 56 p refs Revised
(NASA-TM-X-69779; JSC-08454-Vol-1-Rev-A) Avail: NTIS HC $5.00 CSCL 08H

A computer-aided procedure, for use in the detection and location of areas of surface water, was developed. The procedure utilizes data acquired by the unmanned Earth Resources Technology Satellite (ERTS-1) in conjunction with ancillary data in the form of topographic and highway maps, and meteorological data summaries. The total computer-aided procedure is summarized, the resource requirements for implementation are presented, and operational use of the information derived from the procedure is discussed. Author

N74-16059# Physical Research Lab., Ahmedabad (India).
ENHANCEMENT OF THE EQUATORIAL ANOMALY IN THE TOPSIDE IONOSPHERE DURING MAGNETIC STORMS
R. Raghavarao and M. R. Sivaraman 1973 7 p refs Submitted for publication
(AER-73-05) Avail: NTIS HC $3.00

Alouette ionograms were used to obtain latitudinal variations of the topside electron density through the equatorial anomaly region at American longitudes during eight magnetic storm events. Seven of the events showed enhancements of the anomaly compared to that observed during magnetically quiet conditions. The events related to different phases of the magnetic storms, as well as to different local times. Author

N74-16060*# Michigan Univ., Ann Arbor. Infrared and Optics Lab.
INFORMATION EXTRACTION TECHNIQUES FOR MULTISPECTRAL SCANNER DATA
W. A. Malila, R. B. Crane, and R. E. Turner Jun. 1972 199 p refs
(Contract NAS9-9784)
(NASA-CR-134180; WRL-31650-74-T) Avail: NTIS HC $12.00 CSCL 05B

The applicability of recognition-processing procedures for multispectral scanner data from areas and conditions used for programming the recognition computers to other data from different areas viewed under different measurement conditions was studied. The reflective spectral region approximately 0.3 to 3.0 micrometers is considered. A potential application of such techniques is in conducting area surveys. Work in three general areas is reported: (1) Nature of sources of systematic variation in multispectral scanner radiation signals, (2) An investigation of various techniques for overcoming systematic variations in scanner data; (3) The use of decision rules based upon empirical distributions of scanner signals rather than upon the usually assumed multivariate normal (Gaussian) signal distributions. Author

N74-16061*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB 3: PHOTOGRAPHIC INDEX AND SCENE IDENTIFICATION
Richard W. Underwood and John W. Holland Nov. 1973 257 p
(NASA-TM-X-69780; JL12-602) Avail: NTIS HC $15.00 CSCL 05B

A quick reference guide to the photographic imagery obtained on Skylab 3 is presented. Place names and descriptors are used for frame identification. Author

N74-16062*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIATION ENVIRONMENT FOR ATS-F
E. G. Stassinopoulous Jan. 1974 70 p refs Submitted for publication
(NASA-TM-X-70581; X-601-74-21) Avail: NTIS HC $5.50 CSCL 03B

The ambient trapped particle fluxes incident on the ATS-F satellite were determined. Several synchronous circular flight paths were evaluated and the effect of parking longitude on vehicle encountered intensities was investigated. Temporal variations in the electron environment were considered and partially accounted for. Magnetic field calculations were performed with a current field model extrapolated to a later epoch with linear time terms. Orbital flux integrations were performed with the latest proton and electron environment models using new improved computational methods. The results are presented in graphical and tabular form; they are analyzed, explained, and discussed. Estimates of energetic solar proton fluxes are given for a one year mission at selected integral energies ranging from 10 to 100 Mev, calculated for a year of maximum solar activity during the next solar cycle. Author

N74-16063*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
MICHIGAN EXPERIMENTAL MULTISPECTRAL MAPPING SYSTEM: A DESCRIPTION OF THE M7 AIRBORNE SENSOR AND ITS PERFORMANCE Technical Report, Dec. 1970 - Jun. 1972
Philip G. Hasell, Jr. Jan. 1974 156 p refs
(Contract NAS9-9384)
(NASA-CR-134177; ERIM-190900-10-T) Avail: NTIS HC $10.00 CSCL 08B

The development and characteristics of a multispectral band scanner for an airborne mapping system are discussed. The sensor operates in the ultraviolet, visual, and infrared frequencies. Any twelve of the bands may be selected for simultaneous, optically registered recording on a 14-track analog tape recorder. Multispectral imagery recorded on magnetic tape in the aircraft can be laboratory reproduced on film strips for visual analysis or optionally machine processed in analog and/or digital computers before display. The airborne system performance is analyzed.
Author

N74-16064*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH LATITUDE MINOR ION ENHANCEMENTS: A CLUE FOR STUDIES OF MAGNETOSPHERE-ATMOSPHERE COUPLING
Harry A. Taylor, Jr. Dec. 1973 25 p refs Submitted for publication
(NASA-TM-X-70582; X-621-74-28) Avail: NTIS HC $3.25 CSCL 04A

Unexpectedly abrupt and pronounced distributions of the thermal molecular ions NO(+), O2(+) and N2(+) were observed at mid and high latitudes by the OGO-6 ion mass spectrometer. These minor ions may reach concentration levels exceeding 1000 ions/cu cm at altitudes as great as 1000 km, suggestive of scale heights well in excess of those inferred from low and mid-latitude measurements, under relatively undisturbed conditions. The high latitude ion enhancements were observed to be narrowly defined in time and space, with molecular ion concentrations changing by as much as an order of magnitude between successive orbits.
Author

N74-16065*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MISSISSIPPI SOUND REMOTE SENSING STUDY
B. H. Atwell Apr. 1973 75 p refs Original contains color illustrations
(NASA-TM-X-69783; ERL-048) Avail: NTIS HC $5.75 CSCL 08H

The Mississippi Sound Remote Sensing Study was initiated as part of the research program of the NASA Earth Resources Laboratory. The objective of this study is development of remote sensing techniques to study near-shore marine waters. Included within this general objective are the following: (1) evaluate existing techniques and instruments used for remote measurement of parameters of interest within these waters; (2) develop methods for interpretation of state-of-the-art remote sensing data which are most meaningful to an understanding of processes taking place within near-shore waters; (3) define hardware development requirements and/or system specifications; (4) develop a system combining data from remote and surface measurements which will most efficiently assess conditions in near-shore waters; (5) conduct projects in coordination with appropriate operating agencies to demonstrate applicability of this research to environmental and economic problems.
Author

N74-16066*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
REMOTE MEASUREMENT OF SALINITY: REPEATED MEASUREMENTS OVER A SINGLE FLIGHT LINE NEAR THE MISSISSIPPI SOUND
Gary C. Thomann Aug. 1973 14 p refs
(NASA-TM-X-69782; ERL-079) Avail: NTIS HC $3.00 CSCL 08J

Experiments to remotely determine sea water salinity from measurements of the sea surface radiometric temperature over the Mississippi Sound were conducted. The line was flown six times at an altitude of 244 meters. The radiometric temperature of the sea surface was measured in two spectral intervals. The specifications of the equipment and the conditions under which the tests were conducted are described. Results of the tests are presented in the form of graphs.
Author

N74-16067*# National Aeronautics and Space Administration. Mississippi Test Facility, Bay Saint Louis.
REMOTE MEASUREMENT OF WATER COLOR IN COASTAL WATERS
J. W. Weldon Aug. 1973 57 p refs
(NASA-TM-X-69784; RERL-083) Avail: NTIS HC $5.00 CSCL 08J

An investigation was conducted to develop procedure to obtain quantitative values for chlorophyll and turbidity in coastal waters by observing the changes in spectral radiance of the backscattered spectrum. The technique under consideration consists of Examining Exotech model 20-D spectral radiometer data and determining which radiance ratios best correlated with chlorophyll and turbidity measurements as obtained from analyses of water samples and sechi visibility readings. Preliminary results indicate that there is a correlation between backscattered light and chlorophyll concentration and secchi visibility. The tests were conducted with the spectrometer mounted in a light aircraft over the Mississippi Sound at altitudes of 2.5K, 2.8K and 10K feet.
Author

N74-16068# Anacapa Sciences, Inc., Santa Barbara, Calif.
CHART INTERPRETATION IN LOW-ALTITUDE FLIGHT Technical Report, 1970-1971
James J. McGrath Mar. 1973 52 p refs
(Contract N61339-70-C-0306)
(AD-766466; AS-102-3; NAVTRAEQUIPC-70-C-0306-2) Avail: NTIS CSCL 08/2

The report discusses the use of wide angle cinematic simulators in pilot training intended to augment the training received by U.S. Navy replacement pilots undertaking advanced flight training in low-altitude attack operations. Since chart interpretation is essentially a process of correlating the actual visual scene with its representation on an aeronautical chart, the special characteristics of the low-altitude visual scene and the inherent limitations of aeronautical charts as representations of the earth's surface are described. Then, factors that are critical to accurate interpretation of different classes of features portrayed on charts are discussed and illustrated. (Modified author abstract)
GRA

N74-16069# Institut Franco-Allemand de Recherches, St. Louis (France).
MEASUREMENT OF MESOSPHERIC LIGHT, PART 2 Final Report, 1971 [LICHTMESSUNGEN IN DER MESOSPHAERE. 2. TEIL SCHLUSSBERICHT 1971]
F. Roessler and H. Gulitz 28 Nov. 1972 47 p refs In GERMAN
(Contract T/0260/12630/11013; Contract WRK-157)
(ISL-34/72) Avail: NTIS HC $4.50

The results of noctilucent cloud rocket sounding above Kiruna (Sweden) in 1970 to measure sky luminance are reported. The rocketborne optical and mechanical equipment is described. Data processing and methods to minimize measurement errors due to solar radiation and rocket precession disturbing effects are outlined. At altitudes of 82 and 86 km, two atmospheric layers characterized by mean size dust particle generation, as well as diffuse layers containing Aitken nuclei, were evidenced.
ESRO

N74-16070# Stockholm Univ. (Sweden). Inst. of Meteorology.
THE INFLUENCE OF THE CARRIER GAS ON THE INFRARED GAS ANALYSIS OF ATMOSPHERIC CO2
Walter Bischof Sep. 1973 10 p refs
(Contract SWEDSRC-0223-051)
(AC-26) Avail: NTIS HC $3.00

In order to investigate the influence of different types of gas analyzers and various carrier gases for CO2, mixtures of constant CO2 content but varying N2/O2 ratio were prepared and analyzed. The constant CO2 concentration is connected to the equipment for flash sample analysis. In this way, an analysis reproducibility of about 0.4 ppm can be obtained for an individual sample. Three types of analyzers were investigated: URAS 1, UNOR 2, and UNOR 5B. About 266 mixtures were prepared

and analyzed. The intercomparison of standards (and samples as well) may be complicated by different types of analyzers and gas mixtures used within different projects. ESRO

N74-16071# Instituto Geografico y Catastral, Madrid (Spain). Seccion de Geomagnetismo y Aeronomia.
HARMONIC ANALYSIS OF GEOMAGNETIC FIELD DIURNAL VARIATIONS IN SPAIN DURING ONE SOLAR CYCLE [ESTUDIO MEDIANTE EL ANALISIS ARMONICO DE LA VARIACION DIARIA DEL CAMPO GEOMAGNETICO EN LOS OBSERVATORIOS DE LA PENINSULA IBERICA DURANTE UN CICLO SOLAR]
Fernando Aranaz Y Delrio 1973 146 p refs In SPANISH
Avail: NTIS HC $9.50

The harmonic analysis technique was used to analyze geomagnetic data recorded from the Toledo, Lograno, Almeria, and San Fernando y Coimbra Observatories during the 1958 to 1968 period (which corresponds to one solar activity cycle). The daily variations of the geomagnetic field components were determined and correlated to the solar activity variations. ESRO

N74-16072# Max-Planck-Institut fuer Aeronomie, Lindau Uber Northeim (West Germany). Inst. fuer Stratosphaerenphysik.
A MULTISATELLITE STUDY OF AURORAL-ZONE PHENOMENA. PART 1: OBSERVATIONS DURING A MODERATELY DISTURBED PERIOD ON 11 NOVEMBER 1969
L. Possberg, E. Lammers (Brunswick Univ.), W. Riedler (Tech. Hochschule, Graz), G. Skovli (Norweg. Defence Res. Estab., Kjeller), F. Soeraas (Bergen Univ.), P. Stauning (Tech. Univ., Lyngby, Den.), B. Theile (Brunswick Univ.)08(Radio and Space Res. Sta., Slough, Engl.), and G. R. Thomas Paris ESRO May 1973 56 p refs Sponsored in part by Bundesmin. fuer Forsch. und Technol., Danish Space Res. Inst., Roy. Norweg. Council for Sci. and Technol., Sci. Res. Council, Engl., Space Res. Inst. of the Austrian Acad. of Sci., and Swed. Nat. Sci. Res. Council and ESRO
(ESRO-SR-23-Pt-1) Avail: NTIS HC $5.00

Multisatellite observations of particles and transverse magnetic field variations in and near the auroral zone were studied for moderately disturbed magnetic conditions during 11 November 1969. Particle and field data in the outer magnetosphere and in interplanetary space were also included in the study. The results show that, whereas most but not all of the nightside auroral zone disturbances can be related to changes in the distant magnetosphere, the dayside disturbances are not easily interpreted in terms of such changes. Author

N74-16073# Gesellschaft fuer Weltraumforschung m.b.H., Bad Godesberg (West Germany).
FIRST RESULTS OF STUDIES IN THE FIELD OF EARTH OBSERVATIONS IN PREPARATION OF A PROGRAM IN EUROPE
Alf Loeffler 1973 12 p Presented at the 13th European Space Symp., London, 25-27 Jun. 1973
Avail: NTIS HC $3.00

Applications of remote sensing of interest to small countries with highly developed infrastructures, such as West Germany, are mentioned. These include regional planning, environmental monitoring, agriculture and forestry, and fishery. Aircraft, satellite and space lab remote platforms, and missions are summed up. ESRO

N74-16074# European Space Research Organization, Paris (France). Space Applications Div.
EARTH RESOURCES SATELLITIES: THE INTEREST FOR EUROPEAN INDUSTRY
J. Plevin 1973 18 p refs Presented at the 13th European Space Symp., London, 25-27 Jun. 1973
Avail: NTIS HC $3.00

The need for earth resources surveys in Europe is discussed, with special emphasis on satellite surveys. The present status of remote sensing in Europe is described from both scientific and industrial viewpoints. The present links between earth scientists and industry are outlined, and the future role of industry is discussed. ESRO

N74-16075# European Space Research Organization, Paris (France).
CATALOGUE OF TERRESTRIAL CRATERIFORM STRUCTURES. PART 1: CANADA
R. J. Fryer, comp. (Lancaster Univ.) and C. Titulaer, ed. (Obs. de Paris, Meudon) Dec. 1970 63 p refs Prepared jointly with Intern. Astron. Union
(ESRO-SP-92) Avail: NTIS HC $5.25

A catalog of craters and crateriform structures in Canada is presented. This makes it possible to compare terrestrial features with planetary features of equivalent size. Craters are listed irrespective of their mode of origin, to serve as a basis for the analysis of lunar and planetary photographs. ESRO

N74-16076# European Space Research Organization, Paris (France).
CATALOGUE OF TERRESTRIAL CRATERIFORM STRUCTURES. PART 2: INDONESIA
M. NeumannvanPadang, comp., R. J. Fryer, ed. (Lancaster Univ.), and C. Titulaer, ed. (Obs. de Paris, Meudon) Oct. 1970 63 p refs Prepared jointly with Intern. Astron. Union 2 Vol.
(ESRO-SP-93) Avail: NTIS HC $5.25

A catalog is presented of craters and structures in Indonesia. Comparisons are made of terrestrial features and planetary features. The catalog is comprehensive, and lists craters irrespective of their origin. ESRO

N74-16077# Arizona State Univ., Tempe. Dept. of Chemical Engineering.
MODELING AND SIMULATION OF RESERVOIRS TO PREDICT EVAPORATION REDUCTION BY SURFACE FILMS Technical Report, Jul. 1972 - Jun. 1973
C. O. Reiser and J. L. Adams 1 Sep. 1973 38 p refs
(Contract DI-14-31-0001-3803)
(PB-224138/8GA; OWRR-A-041-ARIZ(1)) Avail: NTIS HC $3.00 CSCL 08H

A computer model was compared to estimate evaporation from a body of water and the value of a monomolecular film as an evaporation suppressant. An energy budget, the Crank-Nicolson numerical method, and Lake Hefner, Arizona, meteorological data were used in the model. These features were organized into a simulation which estimates evaporation and calculates a temperature profile based on a trial and error solution to the equation. The model was written in the FORTRAN 5 computer language as operating on the Univac 1110 computer system. GRA

N74-16078# Systems Applications, Inc., Beverly Hills, Calif.
EXISTING NEEDS IN THE EXPERIMENTAL AND OBSERVATIONAL STUDY OF ATMOSPHERIC CHEMICAL REACTIONS Interim Report
John H. Seinfeld, Thomas A. Hecht, and Philip M. Roth Jun. 1973 357 p refs
(Contract EPA-68-02-0580)
(PB-224203/OGA; R73-21; EPA-R4-73-031) Avail: NTIS HC $7.75 CSCL 07D

This report contains recommendations to aid those concerned with photochemical modeling in planning studies. The suggested programs are designed to provide information needed to develop kinetic models to describe the chemical transformations of atmospheric pollutants. The core of this report focuses on kinetic and mechanistic studies of individual reactions, smog chamber studies, and atmospheric measurement programs that the authors feel should be undertaken to provide the necessary data for model development. Existing deficiencies in knowledge in each of these areas are discussed and the types of programs needed to provide the missing information are examined in detail. The report also includes a short history of model development, describing the various photochemical mechanisms developed to date. Author (GRA)

N74-16079# Ohio State Univ., Columbus. Dept. of Geodetic Science.
APPLICATION OF KINEMATICAL GEODESY FOR DETERMINING THE SHORT WAVE LENGTH COMPONENTS OF THE GRAVITY FIELD BY SATELLITE GRADIOMETRY Ph.D. Thesis. Scientific Interim Report
George B. Reed Mar. 1973 179 p refs
(Contract F19628-72-C-0120; AF Proj. 8607)
(AD-768973; DGS-201; AFCRL-TR-73-0535; SR-9) Avail: NTIS CSCL 08/5

The report describes an investigation into the use of satellite borne gravity gradient devices for the recovery of terrestrial gravity information in terms of discrete mean gravity anomalies, point masses or potential coefficients. Simulation studies were conducted considering two possible instrument configurations: (1) a hand-mounted system capable of sensing five independent components of the gravity gradient tensor and (2) a rotating gravity gradient system. The spatial partial derivatives of a gravitational potential are developed using the methods of tensor calculus with specialization to the potential in spherical harmonics. A method is presented for estimating the root mean square magnitudes of all components of the gravity gradient tensor. The resulting estimates and the simulated solutions for the hard-mounted system strongly indicate that the measuring sensitivities required for the cross-gradient terms are beyond practical limits for satellite gradiometers. In addition, the effect of altitude attenuation on the gradients was evaluated. (Modified author abstract) GRA

N74-16080# DBA Systems, Inc., Melbourne, Fla.
INVESTIGATION OF THE FEASIBILITY OF A SHORT ARC REDUCTION OF SATELLITE ALTIMETRY FOR DETERMINATION OF THE OCEANIC GEOID Final Report, Jan. 1972 - Aug. 1973
Duane C. Brown Aug. 1973 59 p refs
(Contract F19628-72-C-0085; AF Proj. 8607)
(AD-768971; AFCRL-TR-73-0520) Avail: NTIS CSCL 08/5

A short arc approach to the determination of the oceanic geoid from observations made by a satellite-borne radar altimeter entails the recovery of geoidal parameters simultaneously with the recovery of weakly constrained orbital state vectors defining a very large number (i.e., thousands) of independent, interlocking short arcs (arcs typically 1/6 to 1/8 revolution in length). Patterned characteristics of the normal equations make such a simultaneous solution possible, no matter how many sets of orbital parameters are to be recovered. Computer simulations demonstrate that the approach is strongly determinate and can reasonably be expected to produce an oceanic geoid having an rms accuracy approaching one meter from the reduction of GEOS C observations. The major advantage offered by the short arc approach is that it in no way depends on the establishment of a highly accurate reference orbit and thus places only minimal requirements on satellite tracking by external systems. An additional advantage is that observational residuals can be expected to be relatively uncompromised by orbital biases. (Modified author abstract) GRA

N74-16081# Naval Oceanographic Office, Washington, D.C.
ANNUAL VARIATION OF THE INTENSITY OF THE LABRADOR AND WEST GREENLAND CURRENTS AND THE PREDICTION OF TEMPERATURE CONDITIONS IN COMMERCIALLY EXPLOITED REGIONS OF THE NORTHWEST ATLANTIC OCEAN
A. A. Yelizarov 1973 26 p refs Transl. into ENGLISH from Okeanologiya (USSR), v. 2, no. 5, 1962 p 796-809
(AD-768687; NOO-Trans-570) Avail: NTIS CSCL 08/10

The paper reports an investigation of the possibility of predicting temperature conditions in the Newfoundland and Labrador regions from water temperatures along the Kola meridian. Historical temperature data for the Labrador and West Greenland Currents are given and analyzed. GRA

N74-16082# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
ON THE SUBSTANTIATION OF ONE METHOD FOR DETERMINING THE FIGURE OF THE EARTH
I. F. Monin Sep. 1973 10 p refs Transl. into ENGLISH from Dopov. Akad. Nauk Ukr. RSR, Ser. B. (Ukrainia SSR), no. 3, 1973 p 233-236
(AD-768610; DMAAC-TC-1971) Avail: NTIS CSCL 08/5

A closed formula is suggested for determining the earth's figure by means of the gravity anomalies and their derivatives without an assumption of the analytical continuation of the outer gravitational field. The derivatives of the gravity anomalies are computed by the anomalous vertical gravity gradients and the inclination angles of the earth's topographic surface. In the demonstration of the closed formula spherical functions were used. It is considered insufficiently substantiated. A demonstration of the formula without spherical functions is presented, and also a verification of this formula for one partial case is performed on the corresponding model. GRA

N74-16083# Chalmers Univ. of Technology, Goteborg (Sweden). Research Lab. of Electronics.
RECOMBINATION LINE INVESTIGATION OF H 2 REGIONS AT HIGH PRINCIPAL QUANTUM NUMBERS
B. Torgny Cato Aug. 1973 65 p refs
(PB-224137/0GA) Avail: NTIS HC $5.25 CSCL 03B

The 25.6 m (84-foot) radio telescope at Onsala Space Observatory was used for investigations of hydrogen and carbon recombination lines at the 183 alpha and 230 beta transitions in five H2 regions. The hydrogen transitions correspond to 1064.3071 MHz and 1067.0359 MHz, respectively. The equipment, data reduction, and the observational procedure are described and the spectra of the observed lines are shown. In addition to the data of the present observations, previously published data of other transitions were used in a study of the line broadening and the intensity as a function of the principal quantum number n. (Modified author abstract) GRA

N74-16084# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LATITUDINAL VARIATION AND SEASONAL VARIATIONS IN THE TOTAL CONTENT OF ATMOSPHERIC OZONE IN THE INDIAN OCEAN
G. K. Gushchin 6 Sep. 1973 16 p refs Transl. into ENGLISH from Tr. Gl. Geofiz. Observ. (Leningrad), no. 279, 1972 p 85-93
(AD-767886; FTD-HT-23-778-73) Avail: NTIS CSCL 08/10

The report contains analysis of observations for total ozone content which were conducted in the Indian Ocean on the A.I. Voyeykov, and the Yu. M. Shokal'skiy (1961-1970), on the scientific research ship Akademik Korolev (1968-1969), and on the diesel-powered ship Ob' (1966). GRA

N74-16085# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF THE CHEMICAL COMPOSITION OF AN ATMOSPHERIC AEROSOL IN THE SURFACE LAYER
L. S. Ivlev, A. Yu Semova, V. A. Ionin, and V. V. Udalov 29 Oct. 1973 17 p refs Transl. into ENGLISH from Probl. Fiz. Atmos. (Leningrad), no. 9, 1971 p 39-47
(AD-769562; FTD-HT-23-23-74) Avail: NTIS CSCL 04/1

In the report, preliminary data on time and spatial variations of the contents of some chemical elements in inorganic aerosols are examined. Aerosol samples in the years 1967-1969 were studied; then samples were taken on an FPP-15-1.7 PVC filter at Ryl'sk, Leningrad, on the slope of Mount El'brus and in Northern Kazakhstan. GRA

N74-16086# Stanford Research Inst., Menlo Park, Calif.
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA) PROGRAMS RELATED TO HIGH ALTITUDE EFFECTS SIMULATION
C. K. Hinrichs Jun. 1973 21 p refs
(Contract DNA001-72-C-0143)
(AD-769279; SRI-EGU-TN-1928-A8; DNA-3194T) Avail: NTIS CSCL 04/1

The high-altitude effects simulation (HAES) program is a DNA effort to obtain indirectly information on the reaction of the upper atmosphere to nuclear explosions. In the absence of actual nuclear testing in the atmosphere, a number of experiments are being carried out in both the laboratory and the field to determine a sufficient number of parameters to characterize the environment and its reactions in the suitable model. Where disturbance levels in the simulations fall short of those induced by a weapon burst, particular attention is given to understanding the associated phenomena and reliability of extrapolation to weapon levels. The report discusses work done at the Space Environment Laboratory and the Aeronomy Laboratory which is of interest to the HAES program. GRA

N74-16087# General Electric Co., Santa Barbara, Calif.
REACTION RATE DATA, NO. 41
Jul. 1973 36 p refs
(Contract DNA001-73-C-0019)

(AD-769274) Avail: NTIS CSCL 07/4

The report presents summaries of recent progress reports and other information of current interest in the fields of reaction rates, chemistry of the upper atmosphere, and nuclear fireball studies. GRA

N74-16088# Texas A&M Univ., College Station. Dept. of Oceanography.

GEOLOGY AND GEOPHYSICS OF THE BEATA RIDGE, CARIBBEAN

Lamar B. Roemer, William R. Bryant, and Davis A. Fahlquist Sep. 1973 104 p refs

(Contract N00014-68-A-0308; Grant NSF GA-1296)

(AD-768903; A/M-Ref-73-14-T) Avail: NTIS CSCL 08/10

Interpretation of bathymetric, magnetic and seismic reflection surveys in the Beata Ridge region provide evidence for two distinct geologic provinces: (1) the Beata Ridge system; and (2) a Late Cenozoic deformational fold belt north of Venezuela and Columbia. The Beata Ridge is a structural high produced by at least three periods of differential uplift with the earliest faulting in the Late Cretaceous or Early Tertiary. The western side of the ridge is marked by a prominent fault. To the south the scarp is replaced by a series of smaller horsts and grabens. The deformational fold system parallels the northern coast of South America and may have resulted from the Caribbean plate colliding with the Americas plate. The analytical models of potential faults by Hafner (1951) and Sanford (1959) have been tested on the Beata Ridge. The close agreement between theoretical predictions and the observed structure of the basement underlying the ridge is good enough for application of the model on a regional scale. However, the deformation of the sedimentary veneer is primarily by folding accompanied by secondary faulting. (Modified author abstract) GRA

N74-16089# Naval Research Lab., Washington, D.C.

THE WAVE SPECTRUM AND WINDSPEED AS DESCRIPTORS OF THE OCEAN SURFACE Final Report

Lionel T. Moskowitz 30 Oct. 1973 16 p refs

(RF12151402)

(AD-769669; NRL-7626) Avail: NTIS CSCL 08/3

Of the various parameters and phenomena used in describing sea surface conditions, the two most widely used are the wave spectrum and the windspeed. The wave spectrum states how the surface wave energy is distributed with wave frequency. The windspeed is the key parameter for allowing an estimate of the wave spectrum to be made where it is otherwise unobtainable. Remote sensing techniques have been developed to help describe what is occurring at the sea-air interface. In this report the wave spectrum concept is discussed briefly and a systematic approach is taken to describe various ways by which windspeeds at sea are determined. The various techniques for determining windspeeds at sea can be classified in three categories: (a) direct measurements from instrumented platforms, (b) estimates from noninstrumented platforms, and (c) estimates inferred from other data. Such a classification serves to document systematic errors associated with various methods of obtaining windspeed observations. (Modified author abstract) GRA

N74-16090# Naval Research Lab., Washington, D.C.

SOLAR IONIZATION RATES FOR THE IONOSPHERIC E, F, AND D REGIONS

A. W. Ali and P. C. Kepple 25 Oct. 1973 35 p refs

(NRL Proj. A03-19)

(AD-769668; NRL-7598) Avail: NTIS CSCL 04/1

Two approaches were taken to calculate the photoionization rates for the ionosphere. First, a detailed line-by-line deposition for the range 1-1215A was carried out by using experimental or theoretical absorption and ionization cross sections for the atmospheric species. The second approach was to contract these lines into bands having approximately 11 bands for each region, and to calculate the photoionization rate for these new bands. The total photoionization rates for the two methods agree very well. Author (GRA)

N74-16091# Rhode Island Univ., Kingston. Dept. of Physics.

NEW FLUORESCENT TRACER DETECTION TECHNIQUES FOR USE IN POLLUTED ENVIRONMENT Final Report, 1 Jul. 1971 - 30 Jun. 1973

J. A. Northby 30 Jun. 1973 8 p refs

(Contract DI-14-31-0001-3643)

(PB-223965/5GA; OWRR-B-039-RI(1)) Avail: NTIS HC $2.75 CSCL 08H

Polarization properties are reported of the background fluorescence of natural water samples obtained from the Providence River and Narragansett Bay. These properties appear to be subject to the same spatial and temporal variability as the unpolarized background fluorescence. Consequently, it is unlikely that significant improvement in the sensitivity of detection of tracer dyes in polluted water can be achieved by using a dye whose polarization properties are complimentary to those of the background. Author (GRA)

N74-16092# Yale Univ., New Haven, Conn. Dept. of Physics.

LABORATORY STUDIES OF THE STRUCTURE AND INTERACTION OF MOLECULAR ATMOSPHERIC CONSTITUENTS Final Report, 1 Mar. 1972 - 28 Feb. 1973

Vernon W. Hughes 6 Nov. 1973 6 p

(Contract N00014-67-A-0097-0024; NR Proj. 012-149)

(AD-769384) Avail: NTIS CSCL 07/4

The report briefly describes a crossed atomic beam scattering apparatus which includes a mass spectrometer and an on-line PDP-11(40) computer. GRA

N74-16093# Aerospace Corp., El Segundo, Calif.

REMOTE SENSING OF ATMOSPHERIC METHANE USING AN ERBIUM/YAG LASER: A FEASIBILITY STUDY

Kenneth O. White and Gerald T. Wade Nov. 1973 26 p refs

(DA Proj. 1T0-61102-B-53A)

(AD-769732; ECOM-5517) Avail: NTIS CSCL 07/4

A research program is underway to determine the feasibility of a remote sensing scheme for the detection of methane based on a coincidence between the emission of the erbium/YAG laser and a methane absorption line occurring at 1644.9 nm. Two remote sensing techniques are being considered: the differential absorption transmission method and the differential absorption lidar technique. The research program consists of an experimental part to determine the spectral line parameters, and a theoretical part to determine the performance that could be expected from a remote sensing system. The paper reports results of calculations, using the best available data, made to determine the performance that could be expected with the above two techniques. These results indicate that both techniques are feasible with actual performance determined by the atmospheric visibility conditions and the exact value of the absorption coefficient of the methane absorption line. (Modified author abstract) GRA

N74-16094# Naval Research Lab., Washington, D.C.

IMAGE EFFECTS IN BARIUM CLOUD IONOSPHERIC INTERACTIONS Interim Report

S. R. Goldman, S. L. Ossakow, and D. L. Book Oct. 1973 30 p refs

(NRL Proj. H02-27A)

(AD-769474; NRL-MR-2665) Avail: NTIS CSCL 04/1

The report describes the dynamical motion of a small barium plasma cloud, released in the upper ionosphere, which is electrically coupled to the lower ionosphere. The barium cloud induces an image cloud in the lower ionosphere and both structures rotate and elongate with time to form high density core, sheet-like structures which are aligned at a definite angle with the E x B motion of the cloud. This angle depends on the ratio of the ion collision frequency to ion cyclotron frequency in the lower ionosphere. The large density gradients formed in the image cloud suggest that large growth rates due to the gradient drift E x B instability should occur. GRA

N74-16301* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ATMOSPHERIC ELECTRICITY

Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 28 p refs (For availability see N74-16292 07-20) CSCL 04A

N74-16308* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ATMOSPHERIC ATTENUATION RELATIVE TO EARTH-

VIEWING ORBITAL SENSORS
S. Clark Brown and Robert R. Jayrde, Jr. *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 21 p refs (For availability see N74-16292 07-20)
CSCL 04A

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N74-16095 Minnesota Univ., Minneapolis.
USE OF HIGH ALTITUDE PHOTOGRAPHY FOR FOREST DISEASE DETECTION AND VEGETATION CLASSIFICATION WITHIN THE SUB-BOREAL FOREST REGION Ph.D. Thesis
Robert Wendell Douglass 1973 150 p
Avail: Univ. Microfilms Order No. 73-25598

Dwarf mistletoe in black spruce subboreal stands, hypoxylon canker in aspen, and Armillaria root rot in pine plantations are studied. A multispectral investigation of an infected site to determine the optimum film/filter/season parameters, and a low, medium, and high altitude aerial photography were used to study the mistletoe. Hypoxylon canker was indicated by presence of persistant dead foliage. Large scale photography was used to detect Armillaria root rot. Dissert. Abstr.

N74-16096*# California Univ., San Diego.
OPTICAL SIGNAL PROCESSING: POISSON IMAGE RESTORATION AND SHEARING INTERFEROMETRY Ph.D. Thesis
Yie-Ming Hong 1973 274 p refs
(Grant NGL-05-009-079)
(NASA-CR-132919) Avail: NTIS HC $15.75 CSCL 14B

Optical signal processing can be performed in either digital or analog systems. Digital computers and coherent optical systems are discussed as they are used in optical signal processing. Topics include: image restoration; phase-object visualization; image contrast reversal; optical computation; image multiplexing; and fabrication of spatial filters. Digital optical data processing deals with restoration of images degraded by signal-dependent noise. When the input data of an image restoration system are the numbers of photoelectrons received from various areas of a photosensitive surface, the data are Poisson distributed with mean values proportional to the illuminance of the incoherently radiating object and background light. Optical signal processing using coherent optical systems is also discussed. Following a brief review of the pertinent details of Ronchi's diffraction grating interferometer, moire effect, carrier-frequency photography, and achromatic holography, two new shearing interferometers based on them are presented. Both interferometers can produce variable shear. Author

N74-16097*# Rensselaer Polytechnic Inst., Troy, N.Y. School of Engineering.
PRELIMINARY NUMERICAL ANALYSIS OF IMPROVED GAS CHROMATOGRAPH MODEL
Philip T. Woodrow Sep. 1973 100 p refs
(Grant NGL-33-018-091)
(NASA-CR-136776; RPI-TR-MP-36) Avail: NTIS HC $7.00 CSCL 14B

A mathematical model for the gas chromatograph was developed which incorporates the heretofore neglected transport mechanisms of intraparticle diffusion and rates of adsorption. Because a closed-form analytical solution to the model does not appear realizable, techniques for the numerical solution of the model equations are being investigated. Criteria were developed for using a finite terminal boundary condition in place of an infinite boundary condition used in analytical solution techniques. The class of weighted residual methods known as orthogonal collocation is presently being investigated and appears promising. Author

N74-16098*# Scientific Translation Service, Santa Barbara, Calif.
A SIMPLE APPARATUS FOR THE MEASUREMENT OF THE ACTIVITY OF QUICK ACTING DISINFECTING OR STERILIZING SOLUTIONS AND ITS APPLICATION TO THE MEASUREMENT OF THE ACTION OF SODIUM HYPOCHLORITE ON BACTERIAL SPORES
O. Cerf, J.-L. Berry, M. Riottot, and Y. Bouvet Washington NASA Jan. 1974 18 p refs Transl. into ENGLISH from Pathol. Biol. Semaine Hop. (Paris), v. 21, no. 8, 1973 p 889-894
(Contract NASw-2483)
(NASA-TT-F-15238) Avail: NTIS HC $3.00 CSCL 14B

A simple apparatus made from a slightly modified commercial syring has been used to keep Bacillus subtilis var. niger or B. stearothermophilus 1518 (rough variants) spores in contact with sodium hypochlorite at ph 7.0 25 C, 1,000 and 2,000 mg/1 FAC. Spores of B. stearothermophilus 1518 (rough opaque variant) are the most resistant, having a decimal reduction time of 60 seconds with 1,000 mg.1 FAC and 47 sec. with 2,000 mg/1 FAC. These times can be appreciably reduced by the addition of surfactants. Author

N74-16099# National Aeronautical Lab., Bangalore (India).
FLAME ATTACHEMENT TO VSU 2
Dec. 1973 37 p refs Transl. into ENGLISH from Gebrauchanleitung
(NAL-TR-197) Avail: NTIS HC $4.00

This instruction manual provides the information necessary for the conversion of the VSU2 spectrophotometer to a flame photometer by use of a flame attachment. With this, the measuring principle of the unregistered radiation photometer, can be basically obtained with electrical compensation. The flame replaces the glow lamp as the source of light and, as done in emission, at the same time, takes the place of the probes in the cell room. The flame attachment offers the user of the VSU2 an added flexibility of the various application possibilities of the basic unit. The use of a flame photometer converted from a normal spectrophotometer, assumes familiarity with the normal spectrophotometer. Author

N74-16100# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
A COMPARATIVE STUDY OF THE FFA MASS FLOW PROBE AND THE AVA COMBINED PRESSURE-TEMPERATURE PROBE, PART 1
Gunnar Hovstadius 1973 30 p refs
(FFA-AU-936-Pt-1) Avail: NTIS HC $3.50

A comparison between measurements with two probes in supersonic turbulent boundary layers was made. The probes are the combined pressure-temperature probe and the mass-flow probe. The first probe is of the shielded thermocouple type with controlled mass flow through the probe. It is also possible to measure stagnation pressure with the probe. The latter probe measures mass flow and stagnation pressure. The measurements have been compared after making side by side tests in the boundary layer on the M4 nozzle wall of a hypersonic wind tunnel. The results agree within 5% or better. Author

N74-16101# Technical Research Centre of Finland, Helsinki. Reactor Lab.
NEUTRON AND GAMMA RADIOGRAPHY WITH A RESEARCH REACTOR
Heijkkki Reijonen 1973 10 p refs
(Publ-5) Avail: NTIS HC $3.00

Neutron and gamma radiography techniques using a research reactor are discussed. The most fundamental difference between neutron and X-ray radiography is that neutrons interact with atomic nuclei, whereas X-rays interact with the electrons of the atom in the material. With X-rays the mass-absorption coefficient generally increases steadily with the atomic number, whereas the mass-absorption coefficients for neutrons are quite different even for adjacent elements. Thermal neutrons usually show much more relative attenuation than X-rays in materials with a low atomic number. Conversely, thermal neutrons are transmitted

easily by most heavy materials. Another advantage of neutron radiography is the possibility of isotopic differentation since the neutron attenuation for different isotopes of the same element can be quite different. Author

N74-16102*# National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
FLIGHT EXPERIENCE WITH A PIVOTING TRAVERSING BOUNDARY-LAYER PROBE
Lawrence C. Montoya, David A. Brauns, and Ralph E. Cissell Jan. 1974 16 p refs
(NASA-TM-X-56022) Avail: NTIS HC $3.00 CSCL 01D

A pivoting traversing boundary layer probe was evaluated in flight on an F-104 airplane. The evaluation was performed at free stream Mach numbers from 0.8 to 2.0. The unit is described, and operating problems and their solutions are discussed. Conventional boundary layer profiles containing variations in flow angle within the viscous layer are shown for free stream Mach numbers of 0.8, 1.6, and 2.0. Although the unit was not optimized for size and weight, it successfully measured simultaneously flow angularity, probe height, and pitot pressure through the boundary layer. Author

N74-16103# Bureau of Mines, Denver, Colo. Mining Research Center.
A BUREAU OF MINES DIRECT-READING AZIMUTH PROTRACTOR
D. D. Bolstad and M. A. Mahtab 1974 10 p ref
(BM-IC-8617) Avail: NTIS HC $3.00

A description is given of the construction and use of a direct-reading azimuth protractor (DRAP) for measuring fracture orientations in mines, tunnels, or other excavations having a magnetic environment. The DRAP allows a rapid and simultaneous measurement of dip and azimuth of dip of a fracture plane. The instrument is rugged, lightweight, and easily constructible from standard hardware items. The DRAP can measure dip to within + or - 0.5 and azimuth of dip to within + or - 5 of corresponding values obtained with a Brunton compass. Author

N74-16104# Technische Univ., Berlin (West Germany). Fachbereich Konstruktion und Fertigung.
TELEVISION THERMOGRAPHY: A CONTRIBUTION TO DETERMINE THE TEMPERATURE DISTRIBUTION ON A TWIST DRILL Ph.D. Thesis [FERNSEH-THERMOGRAPHIE: EIN BEITRAG ZUR ERFASSUNG DER TEMPERATURVERTEILUNG AM DREHMEISSEL]
Helmut Beyer 1972 153 p refs In GERMAN
Avail: NTIS HC $9.75

Mechanical energy between the workpiece and the drill is almost completely translated into thermal energy during cutting. An infrared quantitative telethermographic method is reported that utilizes multi-diode vidicons to measure the distribution of heat generated during drilling. It is shown that the highest friction temperature develops in the center of the contact zone between cut and tool.

N74-16105# Technische Univ., Berlin (West Germany). Fachbereichsrat des Fachbereichs Elektrotechnik.
A NEW MAGNETIC CONVERTER FOR MEASURING MIXED CURRENTS Ph.D. Thesis [EIN NEUER MAGNETISCHER WANDLER ZUR MESSUNG VON MISCHSTROEMEN]
Detlef Gronwald 1972 160 p refs In GERMAN
Avail: NTIS HC $10.00

A current converter is reported that uses magnetic coupling according to the transformation principle to measure alternating-, direct-, and mixed-currents. Core induction is determined by a Hall transformer for polarization reversal of the measured current moment value. Transl. by G.G.

N74-16106# National Environmental Satellite Service, Washington, D.C.
VERTICAL RESOLUTION OF TEMPERATURE PROFILES FOR HIGH RESOLUTION INFRARED RADIATION SOUNDER (HIRS)
Y. M. Chen, H. M. Woolf, and W. L. Smith Jan. 1974 17 p refs
(NOAA-TR-NESS-67) Avail: SOD HC $0.55

By using the method of Backus and Gilbert, the intrinsic vertical resolution of temperature profiles obtained from the High Resolution Infrared Radiation Sounder on the Nimbus-F satellite, which contains channels in both 4.3-micrometers m and 15-micrometers m CO_2 absorption bands, was evaluated and compared with those of channels in the 4.3 micrometers m band and the 15-micrometers m band alone. It was found that the combination of 4.3 micrometers m and 15-micrometers m bands is superior to the other two cases for all levels of the pressure. Author

N74-16107*# Environmental Research Inst. of Michigan, Ann Arbor.
DISCRIMINATION TECHNIQUES EMPLOYING BOTH REFLECTIVE AND THERMAL MULTISPECTRAL SIGNALS Technical Report, 11 Nov. 1971 - 31 Jan. 1973
W. A. Malila, R. B. Crane, and W. Richardson Nov. 1973 52 p refs
(Contract NAS9-9784)
(NASA-CR-134170; ERIM-31650-75-T) Avail: NTIS HC $4.75 CSCL 14B

Recent improvements in remote sensor technology carry implications for data processing. Multispectral line scanners now exist that can collect data simultaneously and in registration in multiple channels at both reflective and thermal (emissive) wavelengths. Progress in dealing with two resultant recognition processing problems is discussed: (1) More channels mean higher processing costs; to combat these costs, a new and faster procedure for selecting subsets of channels has been developed. (2) Differences between thermal and reflective characteristics influence recognition processing; to illustrate the magnitude of these differences, some explanatory calculations are presented. Also introduced, is a different way to process multispectral scanner data, namely, radiation balance mapping and related procedures. Techniques and potentials are discussed and examples presented. Author

N74-16108*# Michigan Univ., Ann Arbor. Infrared and Optics Div.
ENGINEERING EVALUATION OF 24 CHANNEL MULTISPECTRAL SCANNER
P. F. Lambeck [1973] 160 p Original contains color illustrations
(Contract NAS9-9784)
(NASA-CR-134179; WRL-10822-1-T) Avail: NTIS HC $10.00 CSCL 14B

The results of flight tests to evaluate the performance of the 24 channel multispectral scanner are reported. The flight plan and test site are described along with the time response and channel registration. The gain and offset drift, and moire patterns are discussed. Aerial photographs of the test site are included. F.O.S.

N74-16109# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
CALIBRATED ULTRATHIN CARBON FILMS FOR ELECTRON MICROSCOPY [FILM DI C SOTTILISSIMI CALIBRATI PER MICROSCOPIA ELETTRONICA]
D. Steve Bocciarelli and F. Tangucci 30 Dec. 1972 27 p refs In ITALIAN; ENGLISH summary
(ISS-72/19) Avail: NTIS HC $3.50

Different deposition techniques for obtaining carbon films for electron microscopy, and methods for thickness measurement are discussed. Calibrated films were obtained by a simple procedure. Ultrathin films, from 10 to 15 A in thickness, continuous and strong enough to be used as supporting films for electron microscopy, were easily obtained by this routine method. An example of an image obtained from ribosome subunits deposited on a 15 A carbon film is given. Author

N74-16110*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SKYLAB 2: PHOTOGRAPHIC INDEX AND SCENE IDENTIFICATION
Richard W. Underwood and John W. Holland Jul. 1973 130 p
(NASA-TM-X-69781; JL12-601) Avail: NTIS HC $8.50 CSCL 14B

A quick reference guide to the photographic imagery obtained

on Skylab 2 is presented. Place names and descriptors used give sufficient information to identify frames for discussion purposes and are not intended to be used for ground nadir or geographic coverage purposes. The photographs are further identified with respect to the type of camera used in taking the pictures. Author

N74-16111*# Bowmar Canada, Ltd., Ottawa (Ontario). Research and Development Div.

FABRICATION AND PROPERTIES OF GALLIUM PHOSPHIDE VARIABLE COLOUR DISPLAYS Final Report, May 1972 - July 1973

D. Effer, R. A. MacDonald, G. M. MacGregor, W. A. Webb, and D. I. Kennedy Jul. 1973 52 p refs

(Contract NAS1-11523)

(NASA-CR-132311) Avail: NTIS HC $4.75 CSCL 14B

The unique properties of single-junction gallium phosphide devices incorporating both red and green radiative recombination centers were investigated in application to the fabrication of monolithic 5 x 7 displays capable of displaying symbolic and alphanumeric information in a multicolor format. A number of potentially suitable material preparation techniques were evaluated in terms of both material properties and device performance. Optimum results were obtained for a double liquid-phase-epitaxial process in which an open-tube dipping technique was used for n-layer growth and a sealed tipping procedure for subsequent p-later growth. It was demonstrated that to prepare devices exhibiting a satisfactory range of dominant wavelengths which can be perceived as distinct emission colors extending from the red through green region of the visible spectrum involves a compromise between the material properties necessary for efficient red emission and those considered optimum for efficient green emission. Author

N74-16112*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

CONCEPTUAL DESIGN OF THE SCIENTIFIC INSTRUMENT ARRANGEMENT FOR THE LARGE SPACE TELESCOPE

James L. Zurasky 13 Feb. 1974 28 p

(NASA-TM-X-64805) Avail: NTIS HC $3.50 CSCL 20F

A description of the scientific instrument arrangement for the large space telescope (LST) is given, with some of the rationale for selecting this concept. The first section of this report describes the basic configuration and was designed for an f/20 telescope focal plane. The subsequent LSTWG meeting held in November gave some redirection to the scientific requirements, and these changes are described in the section, Configuration Update. Author

N74-16113# Atomic Energy Commission Research Establishment, Lucas Heights (Australia).

BEHAVIOUR OF HIGH PURITY SEMICONDUCTOR SURFACE-BARRIER NUCLEAR RADIATION DETECTORS AT LOW TEMPERATURES

E. M. Lawson and A. J. Tavendale Apr. 1973 17 p refs

(AAEC/E-260) Avail: AEC Depository Libraries HC $3.00

The characteristics of a germanium and a silicon surface barrier detector were examined at low temperatures (78 to 5 K). Preliminary results have also been obtained from a gallium arsenide detector. All detectors were fabricated from high-purity material. Below some critical temperature (10 K in germanium and 32 K in silicon) the spectral response to gamma-rays deteriorated markedly, particularly for low bias. Near liquid helium temperature, best resolutions of 10.0 KeV at 662 KeV and 3.0 KeV at 122 KeV were obtained with the germanium and silicon detectors, respectively. Relative efficiency measurements found no change in the sensitive depth with temperature in contrast to the indications of the capacitance. A model based on field-assisted detrapping is proposed to account for the fact that sensitive depth is independent of temperature. The behavior of the capacitance and the existence of slow components in the pulse risetime are explained in terms of the equivalent circuit of the detector. Author (NSA)

N74-16114# Rome Univ. (Italy). Inst. of Physics.

PROGRESS IN FLASH-TUBE AND OTHER HODOSCOPE CHAMBERS

M. Conversi 25 May 1973 46 p refs Presented at the Intern. Conf. on Instrumentation for High Energy Phys., Frascati, Italy, 8-12 May 1973

(Nota-Interna-466) Avail: NTIS HC $4.50

Recent improvements in flash tube and other hodoscope chambers are reported. Thus far, hodoscope chambers were employed extensively in cosmic ray experiments to fulfill the needs of low cost track detectors for large collecting areas. Improvements in flash tube characteristics and the development of the plastic chamber have opened possiblities for applications to experiments with particle accelerators as well. The work leading to these improvements and developments is briefly reviewed. ESRO

N74-16115# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France).

GYROSCOPE BALL BEARINGS. INFLUENCE ON HIGH VELOCITY CHARACTERISTICS OF ULTRA LOW VELOCITY BEARING OPERATION [ROULEMENTS A BILLES POUR GYROSCOPES. INFLUENCE DE LA DUREE DE FONCTIONNEMENT A TRES FAIBLE VITESSE D'UN ROULEMENT A BILLES, SUR SES CARACTERISTIQUES A HAUTE VITESSE]

21 Jun. 1973 21 p In FRENCH

(Contract DTEN-72.70.148)

(LRBA-PV-7-602/SIE) Avail: NTIS HC $3.25

The lubricating film of ball bearings, when operating at low speed, might be absent, thus inhibiting the wear of the bearing and, consequently, influencing performance at high speed. Tests on a FRI-5B Barden ball bearing showed that operating for 30 hours at 2 rpm does not influence high speed characteristics. ESRO

N74-16116# Laboratoire de Recherches Balistiques et Aerodynamiques, Vernon (France).

KEARFOTT GYROSCOPE VIBRATION TESTS FOR TYPE GYROFLEX MOD. 2 NO. 3441 [ESSAIS AUX VIBRATIONS DU GYROSCOPE KEARFOTT TYPE GYROFLEX MOD II NO. 3441]

13 Jul. 1973 72 p In FRENCH

(Contract DTEN-71.70.179)

(LRBA-PV-1-209/SIE) Avail: NTIS HC $5.75

The behavior of the Kearfott gyroflex no. 3441 at 240 and 480 Hz was studied in order to verify the performance limits as specified by the manufacturer. A device for frequency synchronizing of tension applied on the rotor; the supply tension frequency of the spinning top was developed. Measurements show that the performance of the gyroscope is within the manufacturer's specification. ESRO

N74-16117# European Space Research and Technology Center, Noordwijk (Netherlands).

TD-1A: INVESTIGATION INTO THE CAUSE OF THE FAILURE OF THE NO. 1 TAPE RECORDER (TR-1) [TD-1A RECHERCHE DE LA CAUSE DE LA PANNE DE L'ENREGISTREUR MAGNETIQUE NO. 1 (TR-1)]

G. Bordereau Jan. 1973 46 p In FRENCH; ENGLISH summary

(ESRO-TR-13-ESTEC) Avail: NTIS HC $4.50

The failure of the TR1 tape recorder on the satellite TD-1A indicated a mechanical problem. Recorded data from the satellite are analyzed. A number of possible mechanisms of failure were artificially induced in the test recorder in an attempt to reproduce the failure symptoms. The results show that the failure was due to a change in tape tension, the cause of which is not clear but was probably due to a degradation of the tape lubricant. Author (ESRO)

N74-16118# National Physical Lab., Teddington (England). Div. of Inorganic and Metallic Structure.

DESIGN AND ASSESSMENT OF A PORTABLE STRESS WAVE EMISSION SYSTEM

B. J. Keene and G. D. Sims Sep. 1973 18 p refs

(NPL-IMS-21) Avail: NTIS HC $3.00

A portable stress wave emission system was constructed and found acceptable for laboratory analysis of failures. Some indication of methods of applying the equipment is given. Stress waves produced by failure processes are detected by piezoelectric transducers in good acoustic contact with the specimen. The

transducer converts the pressure wave it receives into an electrical signal. The portable equipment provides collection, amplification, and processing of these signals. This type of equipment could, for the first time, allow the evaluation of the potential of stress wave emission techniques in a wide range of material and structural problems, and allow the use of these techniques in quality control applications. ESRO

N74-16119# European Space Research and Technology Center, Noordwijk (Netherlands).
THERMOPILES FOR SPACE APPLICATIONS
M. Fabbricotti 1973 15 p refs Presented at the 4emes Journees d'Optique Spatiale, Marseille, 6-8 Nov. 1973
Avail: NTIS HC $3.00

Solid backed thermopiles, was specially developed for use as detectors in earth IR horizon sensors without moving parts, are described. The thermocouples are formed by evaporation, under vacuum, of thin films of p type bismuth telluride/antimony telluride compounds and n type bismuth telluride/bismuth selenide compounds. Thermopile models fabricated so far use glass or kapton as substrate, contain several hundred thermocouples, and have responsivities higher than 10 V/W for time constants on the order of 300 to 400 msec. Fabrication processes are described and the thermopile performance characteristics are analyzed.
Author (ESRO)

N74-16120# European Space Research and Technology Center, Noordwijk (Netherlands).
HIGH PERFORMANCE DEUTERATED TGS ALANINE DOPED PYROELECTRIC DETECTOR
M. Fabbricotti 1973 18 p refs Presented at the 4emes Journees d'Optique Spatiale, Marseille, 6-8 Nov. 1973
Avail: NTIS HC $3.00

A pyroelectric detector using deuterated triglycine sulphate (TGS) doped with alanine was developed primarily in view of space applications. This detector presents improved performances with respect to TGS mainly because of its lower loss tangent, its higher Curie temperature, and its permanent polarization. Two detectors with different sensitive elements are discussed.
Author (ESRO)

N74-16121# European Space Research and Technology Center, Noordwijk (Netherlands).
HORIZON CROSSING INDICATOR TECHNOLOGICAL EXPERIMENT ON ESRO 4
A. S. Menardi 1973 13 p refs Presented at the 4emes Journess d'Optique Spatiale, Marseille, 6-8 Nov. 1973
Avail: NTIS HC $3.00

The history of the horizon crossing indicator, a technological experiment onboard ESRO 4 satellite, is outlined. Main aspects of the system analysis and design of this indicator are reported and a brief account of the data received during the first year of space operation is given. The possibility of measuring local vertical with an accuracy better than 0.25 deg by means of such a sensor was confirmed. ESRO

N74-16122# Radio Corp. of America, Princeton, N.J.
VOLUME HOLOGRAPHIC MATERIAL DEVICE FEASIBILITY FOR MAP DISPLAY APPLICATIONS Final Report, 18 May 1972 - 17 May 1973
William J. Burke and David L. Staebler Jun. 1973 59 p refs
(Contract N62269-72-C-0793)
(AD-769098; PRRL-73-CR-34) Avail: NTIS CSCL 09/5

The report describes the results of a program to apply recent advances in the area of volume phase holographic materials for map storage and display applications, and to develop and evaluate subsystem components and techniques for this purpose. The major achievement of this program was the recording and fixing of up to 100 holograms in a given volume using a new technique for fixing in heavily iron-doped LiNbO3. In addition, a mechanical random-access system for retrieving up to 100 holograms was developed and tested. An investigation was made of direct and indirect display formats, including incoherent readout of thick phase holograms and the recording and playback of encoded object transparencies on a color kinescope. This led to the conclusions that electronic pickup of the readout image is required for maximum use of the potential of a volume holographic storage system. Author (GRA)

N74-16123# Rockwell International Corp., Anaheim, Calif. Electronics Group.
CALIBRATION, TEST, FIELD OPERATION AND REFURBISHMENT OF BALLOON BORNE RADIOMETER Final Report, 25 Feb. 1972 - 30 Jun. 1973
Arthur G. DeBell Jul. 1973 72 p refs
(Contract F19628-72-C-0262; ARPA Order 1366)
(AD-768445; C73-697/201; AFCRL-TR-73-0540) Avail: NTIS CSCL 04/1

A cryogenically cooled, filtered infrared radiometer built on a previous contract has been calibrated, installed on a high altitude balloon platform, flown three times and refurbished between flights. This radiometer has several unique features which include the options for the remote operation of two filter wheels each containing six filters at helium temperature, and a rotary chopper which may be run at 200 cycles per second or positioned open. It contains a 10 in. diameter Cassegrain telescope with nine field stops in its focal plane. Each of these field stops is reimaged on a separate detector for stray radiation rejection. The fields of view of the detectors are small and varied in size and shape. The telescope is mounted on a two axis alt azimuth/artillery type/servo operated gimbal which makes sky scans under the control of an on-board programmer. The cryogenically cooled telescope is fitted with an antifrost device which protects the system at altitudes above 35,000 ft. The system is capable of absolute spectral radiometry in bands from 3 to 25 microns.
Author (GRA)

N74-16124# Instrument Flight Center, Randolph AFB, Tex.
OPERATIONAL TEST AND EVALUATION OF R C ALLEN THREE-INCH ATTITUDE INDICATOR Final Report
Joseph K. Beaty Sep. 1973 77 p refs
(AD-768392; IFC-TR-73-11) Avail: NTIS CSCL 01/4

The Research and Development Division of the USAF Instrument Flight Center conducted a test and evaluation of the R. C. Allen 3-inch self-contained attitude indicator, model 26C-1. Approximately 50 hours were flown, using a T-37 as the test bed to evaluate the indicator. Primary emphasis of the evaluation was from a human factors aspect rather than an engineering performance. (Modified author abstract) GRA

N74-16125# Defense Documentation Center, Alexandria, Va.
NON-DESTRUCTIVE TESTING: ULTRASONICS Bibliography Report, Jan. 1964 - May 1973
Nov. 1973 191 p refs
(AD-769200; DDC-TAS-73-65) Avail: NTIS CSCL 14/2

The bibliography is a compilation of unclassified-unlimited citations on Non-Destructive Testing: Ultrasonics. References pertain to ultrasonic techniques for inspection of welds, thickness measurements, flaw detection evaluation and characterization of materials, fatigue damage and crack detection. Corporate Author-Monitoring Agency, Subject, Title, and Personal Author Indexes are included. Author (GRA)

N74-16126# Hamilton Standard, Windsor Locks, Conn.
ELECTRO-STATIC TRANSDUCER PROGRAM Final Report, 12 Jun. 1972 - 19 Oct. 1973
Richard K. Davenport 19 Oct. 1973 96 p
(Contract F33615-72-C-2090; AF Proj. 3066)
(AD-769039; AFAPL-TR-73-86) Avail: NTIS CSCL 14/2

The report describes the research and development of a high temperature electro-static transducer. A parallel plate breadboard unit was designed, built, and tested to evaluate the feasibility of the concept and the accompanying demodulation electronics. A study was then conducted to determine the configuration and materials for a high temperature unit. This resulted in the design and manufacture of a two-inch displacement transducer with cylindrical quartz elements supporting metalized patches. Moving contacts in the device were eliminated by conducting the electrical signal from the inner moving element by means of an inconnel spring. Test results obtained with the unit indicated that the transducer provides an accurate means of displacement measurements up to 600F. It is concluded that with minor modifications and continued testing, accurate displacement measurements could be obtained with this device at temperatures up to 1000F. Author (GRA)

N74-16127# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A 1 keV ION PROBE FOR THIN FILM ANALYSIS M.S. Thesis
Fred H. Porter, III 13 Jun. 1973 99 p refs
(AD-768348; GE/EE/73S-5) Avail: NTIS CSCL 14/2

A 1 KeV ion probe analyzer was designed and assembled for thin film analysis. The major components include a QUAD 250B quadrupole mass spectrometer manufactured by Electronic Associates, Inc., and a Phi 04-131 sputter ion gun manufactured by Physical Electronics Industries, Inc. The distinctive features of the analyzer are its low energy ion source and its ability to sputter and analyze conducting and nonconducting materials equally well. The instrument can resolve impurity densities of one part in 1000 from sputtered secondary ions, and the etch rate achieved is 800 angstroms per hour on a permalloy target. The report contains sample spectra and the necessary details to use it as an operating manual for the analyzer. Recommendations include modifications for improved sensitivity, establishment of measurement standards, and further work for time-of-flight and ion energy measurements. Author (GRA)

N74-16128# Defense Documentation Center, Alexandria, Va.
NONDESTRUCTIVE TESTING: METHODS, TECHNIQUES AND THEIR APPLICATIONS Report Bibliography, May 1964 - Apr. 1973
Nov. 1973 297 p refs
(AD-769450; DDC-TAS-73-67) Avail: NTIS CSCL 14/2

Methods and techniques, such as electromagnetic, eddy current, holography, magnetic photoplasticity, optical correlation, and light scattering, are discussed. Data are also presented in flaw detection, fatigue damage, thickness measurements, techniques for inspection, crack detection, and materials properties. Author (GRA)

N74-16129# Texas Univ., Austin. Applied Research Labs.
OPERATING INSTRUCTIONS FOR CALIBRATED SOURCE
Wiley S. Olsen 30 Aug. 1973 11 p
(Contract N60921-73-C-0107; Proj. CAPTOR)
(AD-768861; ARL-TM-73-26) Avail: NTIS CSCL 14/2

The memorandum describes a calibrated source which can transmit a continuous 52 kHz tone or a 30 msec pulse having a 100 msec pulse repetition period. The memorandum is intended to be used as an operating instruction and repair manual. (Modified author abstract) GRA

N74-16130# Naval Training Equipment Center, Orlando, Fla.
HEADS UP DISPLAY SYSTEM USING NONPARAXIAL HOLOGRAPHIC LENSES
William C. Oelfke Sep. 1973 18 p refs
(AD-769117; NAVTRAEQUIPC-TN-38) Avail: NTIS CSCL 01/4

A study was made of optical systems employing holographically produced lens elements. The basic third-order aberration terms are defined for nonparaxial configurations of holographic lenses and three techniques of aberration balancing are suggested. One technique eliminates chromatic aberration from white light scenes with two lens elements and is incorporated into a heads up display system so that its capabilities may be studied. Author (GRA)

N74-16131# Naval Research Lab., Washington, D.C.
COMPUTER PROGRAM FOR INCREASING THE ACCURACY OF IMPEDANCE MEASUREMENTS PERFORMED WITH A HEWLETT PACKARD MANUAL NETWORK ANALYZER Interim Report
George T. Oreilly and Robert E. Neidert Nov. 1973 14 p refs
(NRL Proj. r02-06)
(AD-769667; NRL-MR-2676) Avail: NTIS CSCL 14/2

A computer program for correcting impedance measurements performed with a Hewlett Packard manual network analyzer is described. The program incorporates a correction routine which accounts for the inherent errors in the measuring equipment. Elimination of the equipment error significantly increases the accuracy of the impedance measurement. The program is written in FORTRAN and is configured for use with the Control Data Corporation time share system. Author (GRA)

N74-16132# Ballistic Research Labs., Aberdeen Proving Ground, Md.
A RECOIL PROTON TELESCOPE FOR ACCURATE FAST-NEUTRON FLUX MEASUREMENT
Andrus Niiler and Jame E. Youngblood Jul. 1973 42 p refs
(AD-769708; BRL-1657) Avail: NTIS CSCL 18/4

A recoil proton telescope has been designed, built, and tested at the Radiation Laboratory, BRL. This device is capable of absolute fast-neutron flux measurement in the energy range 2-20 MeV to an accuracy of better than 3%. Measurements of the telescope efficiencies at 2.60 and 14.30 MeV agree with several calculations to well within the estimated uncertainties. Thus, absolute flux measurements can be provided for the monitoring of irradiations and cross-section measurements. Author (GRA)

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N74-16133 Central Electricity Generating Board, London (England).
ELECTROSTATIC PRECIPITATION: A SELECTIVE BIBLIOGRAPHY, MAY 1962 - MAY 1973
Nov. 1973 25 p refs
(CE-Bib-40B.1) Avail: Issuing Activity

A selective bibliography of reports on the subject of electrostatic precipitation is presented. The documents are indexed according to author, published sources, and restricted sources. The subjects involved include the following (1) industrial electrostatic precipitation, (2) efficiency of electrostatic precipitators as affected by the properties and combustion of coal, (3) rate of dust emission from a precipitator, (4) selection of electrode material for electrostatic precipitators, and (5) effective collection of fly ash at pulverized coal-fired plants. Author

N74-16134 British Library Lending Div., Boston Spa (England).
HEAT-TREATABLE SINTERED STEEL FROM STEEL POWDER ALLOYED WITH NICKEL AND MOLYBDENUM
N. Dautzenberg 5 Jul. 1973 14 p Transl. into ENGLISH from Z. Werkstofftech. (West Germany), v. 3, 1972 p 415-419 In ENGLISH and GERMAN
(BLL-LTI-746-1454-(9022.401)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

The characteristics of heat treatable, sintered steel produced from steel powder alloyed with nickel and molybdenum are discussed. The relative effects of the most important alloying elements on increases in strength and hardenability of steel are tabulated. The advantages and disadvantages of pre-alloyed steel powders are examined. The dimensional behavior of the steel specimens during sintering and heat treatment is analyzed. The microstructure of the sintered steels is determined the effect on the mechanical properties. Author

N74-16135* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EJECTABLE UNDERWATER SOUND SOURCE RECOVERY ASSEMBLY Patent
Stephen C. Irick, inventor (to NASA) Issued 1 Jan. 1974 5 p Filed 19 Jul. 1972 Supersedes N72-31493 (10 - 22, p 2971)
(NASA-Case-LAR-10595-1; US-Patent-3,783,443; US-Patent-Appl-SN-273240; US-Patent-Class-340-5R; US-Patent-Class-340-8R; US-Patent-Class-340-12R) Avail: US Patent Office CSCL 09E

An underwater sound source is described that may be ejectably mounted on any mobile device that travels over water, to facilitate in the location and recovery of the device when submerged. A length of flexible line maintains a connection between the mobile device and the sound source. During recovery, the sound source is located be particularly useful in the recovery

of spent rocket motors that bury in the ocean floor upon impact. Official Gazette of the U.S. Patent Office

N74-16136 Purdue Univ., Lafayette, Ind.
THE DYNAMICS AND GAS DYNAMICS OF A CIRCULAR AEROSTATIC THRUST BEARING Ph.D. Thesis
Douglas Keith Warinner 1973 209 p
Avail: Univ. Microfilms Order No. 73-28162

Incompressible and subsonic compressible flow theories are developed for the dynamics of a circular aerostatic bearing with a single central orifice. The incompressible flow theory accounts for the turbulent and laminar flow regions of the film through the use of a laminarization criterion and reduces to the two special cases of laminar and turbulent flows. The results of the compressible flow analysis are restricted to laminar flow. Both theories account for the fluid's inertia and local acceleration. The dynamic and equilibrium theoretical results agree favorably with the experimental data available for a lightly loaded gas-lubricated bearing. Dissert. Abstr.

N74-16137 North Carolina State Univ., Raleigh.
THE DESIGN OF MINIMUM WEIGHT ROTORS WITH SPECIFIED CRITICAL SPEEDS Ph.D. Thesis
Joan Lawrence Cox 1973 60 p
Avail: Univ. Microfilms Order No. 73-29535

Variational calculus is applied to the equations of motion for a rotating shaft to obtain the profile of the minimum weight rotor for a specified critical speed. The equations of motion are the Timoshenko beam equations which include the effects of transverse shear and gyroscopic inertia. Inequality constraints on the cross sectional area are imposed to provide for a more realistic solution. Both first and second critical speeds are considered. The optimum profiles are presented for four types of rotor supports. These cases require the definition of end point constraints, interior point constraints, and discontinuities which are essential to the solution by variational techniques. In some cases the optimum rotor provided up to 75 percent reduction in weight over a comparable cylindrical rotor of uniform cross sectional area. Dissert. Abstr.

N74-16138*# HLM, Inc., Waldwick, N.J.
DIGITAL HYDRAULIC VALVING SYSTEM Final Report
24 Aug. 1973 55 p refs
(Contract NAS8-28166)
(NASA-CR-124466) Avail: NTIS HC $4.75 CSCL 13I

The design and development are reported of a digital hydraulic valving system that would accept direct digital inputs. Topics include: summary of contractual accomplishments, design and function description, valve parameters and calculations, conclusions, and recommendations. The electrical control circuit operating procedure is outlined in an appendix. K.M.M.

N74-16139*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ANTHROPOMORPHIC MASTER/SLAVE MANIPULATOR SYSTEM Patent Application
Hubert C. Vykukal, Reginald F. King, and Wilbur C. Vallotton, inventors (to NASA) Filed 24 Jan. 1974 37 p
(NASA-Case-ARC-10756-1; US-Patent-Appl-SN-436313) Avail: NTIS HC $4.00 CSCL 05H

An anthropomorphic master/slave manipulator system is described. The master arm apparatus includes: master tubular articulated portions which are coaxially adjacent to one another and relatively rotatable, and master transducing apparatus responsive to the relative rotation of the adjacent tubular portions and operative to provide a driving signal. A slave arm apparatus is provided with slave tubular portions corresponding to those portions of the master arm apparatus. NASA

N74-16140# Pisa Univ. (Italy). Facolta di Ingegneria.
EXPERIMENTAL RESEARCH IN THE REGIME OF FLUID THERMODYNAMICS OF HYDROSTATIC THRUST BEARINGS [RICERCA SPERIMENTALE SUL REGIME TERMOFLUIDODINAMICO NEI CUSCINETTI IDROSTATICI DI SPINTA]
Roberto Bassani [1973] 42 p refs In ITALIAN
(Rept-1417) Avail: NTIS HC $4.25

The methodology and results are reported of an experimental research in the fluid thermodynamics of rotating hydrostatic bearings. It is shown that fluid friction can be determined by the surface temperature of the fixed and rotating plates, a fall in the load on the bearing, and a fall in the oil pressure at the orifice. It is concluded that friction losses can be eliminated by the proper selection of the bearing geometry. Transl. by F.O.S.

N74-16141# Technische Hogeschool, Delft (Netherlands). Dept. of Mechanical Engineering.
ON THE ROLLING CONTACT OF TWO ELASTIC BODIES IN THE PRESENCE OF DRY FRICTION Ph.D. Thesis
J. J. Kalker Aug. 1973 165 p refs
(WTHD-52) Avail: NTIS HC $10.25

The characteristics of two purely elastic, perfectly smooth bodies of revolution when pressed together so that a finite contact area is formed are discussed. The effects of applying a couple to the bodies are described. The phenomena in the contact area are analyzed and a relationship is established which connects the creepage and the spin with the total tangential force which the bodies exert upon each other. The investigation leads to the construction of a system of linear equations by which the displacements can be expressed in terms of the surface tractions. Author

N74-16142# Technische Univ., Berlin (West Germany). Fachbereich Werkstoffwissenschaften.
FRICTION AND WEAR OF GOLD Ph.D. Thesis [REIBUNG UND VERSCHLEISS VON GOLD]
Hartmut Frey 1972 111 p refs In GERMAN
Avail: NTIS HC $7.75

Sliding friction on gold-gold materials is analyzed for the effects of load, friction-path and -velocity, crystallographic orientation, and atmospheric effects. It is shown that the friction and abrasion mechanisms consist of: (1) Material surface layer transfer; (2) wedge formation; (3) metal surface fatigue; (4) microstructural contact welding and abrasion; (5) abrasion particle formation; (6) grooving; and (7) fusion of individual surface microcontacts. Transl. by G.G.

N74-16143# Technische Univ., Berlin (West Germany). Fachbereich Kybernetik.
COMPARATIVE TECHNOLOGICAL SYSTEMS STUDY ON OUTSIDE DATA PROCESSING FOR THE PRODUCTION WITH NUMERICAL CONTROLLED TOOLING MACHINES Ph.D. Thesis [VERGLEICHENDE SYSTEMTECHNISCHE UNTERSUCHUNGEN DER AEUSSEREN DATENVERARBEITUNG FUER DIE FERTIGUNG NUMERICH GESTEUERTEN WERKZEUGMASCHINEN]
Murat Dincmen Jul. 1972 143 p refs In GERMAN
Avail: NTIS HC $9.25

Investment planning with progressive automatization requires inclusion of external data processing as automatic controlled machining processes increase in conventional production methods. Models for an external digital classification and simulation system are derived that consider: (1) The interdependence between in house and external data processing; (2) material evaluation and information processing times; (3) inclusion of material flow and information flow observations; (4) cost estimates for elements of inhouse and external data processing methods; and (5) descriptions of workpieces and elements of data processes for developing economic realistic investment alternatives.
Transl. by G.G.

N74-16144*# Georgia Inst. of Tech., Atlanta. School of Mechanical Engineering.
INVESTIGATIONS OF LUBRICANT RHEOLOGY AS APPLIED TO ELASTOHYDRODYNAMIC LUBRICATION Final Technical Report
S. Carlson, V. Turchina, J. Jakobsen, D. M. Sanborn, and W. O. Winer Oct. 1973 141 p refs
(Grant NGR-11-002-133)
(NASA-CR-134539) Avail: NTIS HC $9.25 CSCL 11H

The pressure viscometer was modified to permit the measurement of viscosity at elevated pressures and shear stresses up to 5 x 10 to the 6th power N/sq m (720 psi). This shear stress is within a factor of three of the shear stress occurring in a sliding ehd point contact such as occurs in the ehd simulator. Viscosity data were taken on five lubricant samples, and it was

found that viscous heating effects on the viscosity were predominant and not non-Newtonian behavior at the high shear stresses. The development of the infrared temperature measuring technique for the ehd simulator was completed, and temperature data for a set of operating conditions and one lubricant are reported. The numerical analysis of the behavior of nonlinear lubricants in the lubrication of rollers is reported. Author

N74-16145*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF TIP RELIEF ON ENDURANCE CHARACTERISTICS OF SUPER NITRALLOY AND AISI M-50 SPUR GEARS
Dennis P. Townsend and Erwin V. Zaretsky Washington Feb. 1974 22 p refs
(NASA-TN-D-7535) Avail: NTIS HC $2.75 CSCL 13I

Tests were conducted with two groups of 8.89-centimeter (3.5-in.) pitch diameter spur gears with standard 20 deg involute profile with tip relief made of CVM Super-Nitralloy (5Ni-2Al) and CVM AISI M-50 at a temperature of 350 K (170 F). Super-Nitralloy gears with tip relief had a life 150 percent that of gears without tip relief. An increased scoring phenomenon was noted with the Super-Nitralloy gears with tip relief. Through-hardened AISI M-50 gears with tip relief failed due to tooth fracture. AISI M-50 gears without tip relief had a life approximately 40 times greater than the AISI M-50 gears with tip relief. Author

N74-16146*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SELF-LUBRICATING PLASMA-SPRAYED COMPOSITES FOR SLIDING CONTACT BEARINGS TO 900 C
Harold E. Sliney Washington Feb. 1974 26 p refs
(NASA-TN-D-7556; E-7574) Avail: NTIS HC $3.00 CSCL 11H

Plasma-sprayed composites which have good oxidation-resistance and self-lubricating characteristics to 900 C were developed. The composites are a Nichrome matrix containing dispersed glass for oxidation protection and calcium fluoride for lubrication. They are applied to bearing surfaces in layers about 0.050 cm thick by plasma-spraying; the layers are then machined to a thickness of 0.025 cm. Oscillating bearing tests were performed in air to 900 C at unit radial loads up to 3.5 times 10 to the 7th power Newtons per square meter (5000 psi) and a thrust load of 1960 Newtons (440 lb). Bearings with a composite liner in the bore were in good condition after over 50,000 oscillating cycles accumulated during repeated bearing temperature cycles between 25 and 900 C. Author

N74-16147# Central Electricity Generating Board, London (England).
GLOSSARY OF SYSTEMS ENGINEERING AND SYSTEMS MANAGEMENT EFFECTIVENESS TERMS AND DEFINITIONS TOGETHER WITH A SELECTED READING LIST AND BIBLIOGRAPHY, COVERING THE TECHNICAL SUPPORT DISCIPLINES OF QUALITY: RELIABILITY AND MAINTAINABILITY TO THE ENGINEERING OF HARDWARE SYSTEMS/EQUIPMENT AND PRODUCTS
T. Hughes, comp., P. G. Williams, comp., and D. Norman, comp. Nov. 1973 171 p refs
(CE-Bib-239; IT55) Avail: NTIS HC $10.75

Definitions based on a literature search and on the common English definition and use of words and phrases relevant to quality; reliability; maintainability and other related disciplines to systems management and systems engineering are presented. The intent and purpose of the glossary is to improve and harmonize clarity of communication and information generation. A standardized interpretation of reliability and quality assurance terms and definitions applicable throughout the definition and determination of system, equipment and product quality is provided. The terms and definitions apply to those terms used in various R & QA publications and documents and may be used in specifications, standards, drawings, technical manuals, procurement documents, quality control; inspection and test as well as other related documents including engineering evaluation reports, in support of technical definition, reliability and quality assurance or other related programs. Author

N74-16148*# Kanner (Leo) Associates, Redwood City, Calif.
COMPARATIVE STUDY OF THE ECONOMY ASPECTS OF A DIGITAL ELECTROHYDRAULIC ACTUATOR
C. Brinckmann Washington NASA Feb. 1974 16 p refs Transl. into ENGLISH of "Vergleichende Betrachtung zur Frage der Wirtschaftlichkeit eines Digitalen Electro-Hydraulischen Stellantriebs", Rept. DLR-FB-73-105 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Munich, 1973 19 p
(Contract NASw-2481)
(NASA-TT-F-15296; DLR-FB-73-105) Avail: NTIS HC $3.00 CSCL 13I

A digital hydraulic actuator for linear motion, consisting of cylinders in series, is compared with an analog servo actuator with regard to the consumption of pressurized oil as an index of economic operation. A description is given of the economic boundaries in general and of the special case of an actuator in aircraft control. Author

N74-16149*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF SURFACE TOPOGRAPHY ON STRUCTURAL GROWTH OF THICK SPUTTERED FILMS
Talivaldis Spalvins and William A. Brainard Washington Feb. 1974 22 p refs
(NASA-TN-D-7577; E-7655) Avail: NTIS HC $2.75 CSCL 13H

Primarily thick sputtered S-Monel, silver, and 304 stainless steel coatings were deposited on mica, glass, and metal substrates with various surface finishes to investigate the structural growth of the coating by scanning electron microscopy. Compositional changes within the coating were analyzed by X-ray dispersion microscopy. Defects in the surface finish act as preferential nucleation sites and form isolated and complex nodules and various surface overgrowths in the coating. These nodules do not disappear after full annealing. Further, they have undesirable effects on mechanial properties; cracks are initiated at the nodules when the coating is stressed by mechanical forces. These effects are illustrated by micrographs. Nodular growth within a coating can be minimized or eliminated by reducing the surface roughness. Author

N74-16150*# New Hampshire Ball Bearings, Inc., Peterborough.
DEVELOPMENT OF SPECIAL LUBRICANTS FOR BALL BEARINGS OPERATING IN VACUUM Final Report
May 1973 43 p ref Submitted for publication
(Contract NAS5-9624)
(NASA-CR-132917) Avail: NTIS HC $4.25 CSCL 11H

A ball bearing life test program was performed to obtain data on the efficiencies of various lubricated and self-lubricating ball retainer systems for instrument bearings in a vacuum environment. The program utilized light to moderate radial loads at relatively low speeds on a NASA-GSFC designed and supplied test rig. Several systems were found which gave acceptable bearing life under the test conditions used, but the most consistent low running torques after testing resulted from oil lubrication. Author

N74-16151*# Techtran Corp., Glen Burnie, Md.
INFLUENCE OF THE CHEMICAL STRUCTURE OF PHOSPHORUS-BASED EP ADDITIVES ON THEIR EFFECTIVENESS
K. Weber, E. Eberhardt, and G. Keil Washington NASA Feb. 1974 13 p refs Transl. into ENGLISH from Schmierungstech. (Leipzig), v. 4, no. 12 p 372-377 Presented at 12th Intern. Technol. Symp. on Lubrication, Leipzig
(Contract NASw-2485)
(NASA-TT-F-15341) Avail: NTIS HC $3.00 CSCL 11H

Investigations are reported on the influence of the structure of phosphorus-based additives and model substances on their effectiveness in low and high load regions in the four-ball apparatus. The results of four-ball apparatus runs with different stresses are compared with investigations on the reactivity of compounds with metals under thermal excitation under static conditions. It is shown that the wear-reducing effect at low loads (less than failure load) increases with decreasing reactivity of the compounds against iron within the region investigated.

On the other hand, the four-ball apparatus welding load increases with increasing reactivity of the compounds to iron. The results were obtained by trial runs on the four-ball apparatus - an easily accessible device - and at present are valid only for this.
Author

N74-16152# Centre de Recherches Scientifiques et Techniques de l'Industrie des Fabrications Metalliques, Brussels (Belgium). Section Construction Mechanique.
MANUAL PROGRAMMING OF NUMERICALLY CONTROLLED LATHES. SYNTHESIS OF PROBLEMS - A FEW MEANS OF RESOLVING THEM [LA PROGRAMMATION MANUELLE DES TOURS A COMMANDE NUMERIQUE. SYNTHESE DES PROBLEMES POSES - QUELQUES MOYENS DE LES RESOUDRE]
P. Gaudissart and Willy DuMong Sep. 1973 82 p refs In FRENCH Sponsored by the Inst. pour l'Encour. de la Rech. Sci. dans l'Ind. et l'Agr.
(CRIF-MC-48) Avail: NTIS HC $6.25
A series of problems connected with the numerical control of lathes is discussed: presetting of tools, computation of cutting conditions, and initial positioning of the tools. A general dossier on the various options and characteristics available for a given lathe is presented.
ESRO

N74-16153# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
INTEGRATED AUTOMISATION OF SEMICONDUCTORS COMPONENTS PRODUCTION LINE
A. Titli, M. Richetin, J. P. Richard, M. Lemaitre, C. Hernandez, G. Giralt, and D. Esteve 1973 22 p refs Presented at the Intern. Inst. for Appl. Systems Anal. Conf. on Control of Integrated Ind. Systems, Vienna, 1-3 Oct. 1973
Avail: NTIS HC $3.25
The production process is defined more precisely, and a graphic representation is proposed. The principal functions of diagnosis, supervision, and control are introduced into a hierarchical structure. Some methods relative to these different functions are developed. The integration of technical and economic management is briefly described, illustrating different methods.
ESRO

N74-16154# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain).
FOLDABLE BOOM SYSTEMS STUDY. FIRST PHASE: INITIAL STUDIES Final Report
M. A. OrtegaPerez, A. RodriguezVilla, J. DelaTorrePineiroa, T. ElicesConcha, J. L. EspinoGranado, J. FernandezSintes, M. MartinezLlaneza, A. PenasAbella, V. TorroglosaPonce, A. MartiMoral et al Paris ESRO May 1973 185 p refs
(Contract ESTEC-1130/70)
(ESRO-CR-164) Avail: NTIS HC $11.25
An evaluation was made of various types of foldable rod and girder boom systems in an effort to select the type best suited dynamically and structurally for spacecraft applications. Feasibility, reliability, and availability are also considered. Attention was given to configuration and mode of deployment. Hinges and locking devices, actuators, fastening, and release, mechanisms are all dealt with. Various control systems are idealized and their mathematical models defined.
Author (ESRO)

N74-16155# California Univ., Los Angeles. School of Engineering and Applied Science.
RECENT DEVELOPMENTS IN ACOUSTIC EMISSION AS APPLIED TO WELDING DEFECTS
Kanji Ono Sep. 1973 23 p refs
(Contract N00014-69-A-0200-4031)
(AD-768396; UCLA-ENG-7375) Avail: NTIS CSCL 13/5
Recent developments in acoustic emission testing as related to welded structures are presented, focusing the attention to signal characterization, fracture induced acoustic emission, and large scale testing to locate flaws. Successful applications as well as the areas in need of further research are identified.
Author (GRA)

N74-16156# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A STUDY OF THE STRESSED-STRAINED STATE OF METAL DURING THE FORMING OF LATERAL CORRUGATIONS IN ROLLERS
Yu. N. Alekseev and O. I. Trisheveskii 29 Oct. 1973 19 p Transl. into ENGLISH from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 25, 1971 p 104-114
(AD-769565; FTD-HT-23-188-74) Avail: NTIS CSCL 13/8
The technology of producing sheets and profiles with dead-end lateral corrugations is discussed. The equations for the field of displacement velocities for elementary particles are given, and the basic relationship characterizing the stress-strain state of metals during the formation of dead-end corrugations is determined. It is concluded that during roller forming of corrugations, plane plastic flow occurs.
F.O.S.

N74-16157# Martin Marietta Aerospace, Orlando, Fla.
MANUFACTURING METHODS AND TECHNOLOGY STUDY COVERING METHODS FOR MANUFACTURING ELECTRONIC MODULES. MANUFACTURING METHODS FOR ELECTRONIC MODULES Final Report, Mar. 1972 - Jan. 1973
William H. Pfeil and Frederick E. Tantaglia Jan. 1973 560 p
(Contract DAAH03-71-C-0006)
(AD-768855; OR-12332; ILS-4-72) Avail: NTIS CSCL 09/5
A process and workmanship manual for use in the manufacture of missile electronic modules was prepared, using an industry producer-user survey for state-of-the-art processes, materials, and equipment. The areas of manufacturing technology covered by this manual includes cleaning, drilling, resist coating, etching, plating, assembling, soldering, and conformal coating. The information depicted in each area of technology covered includes materials, equipment, procedures, rework, in-production testing, and production checkpoints. Also, workmanship bulletins presented as Do's and Don'ts covering procedures, equipment, and processing materials are presented for each area of technology.
Author (GRA)

N74-16158# Martin Marietta Corp., Orlando, Fla.
MANUFACTURING METHODS AND TECHNOLOGY STUDY COVERING METHODS FOR MANUFACTURING ELECTRONIC MODULES Final Summary Report
Sol C. Osborne, Robert C. Rang, and William H. Pfeil Jan. 1973 28 p refs
(Contract DAAH03-71-C-0006)
(AD-768856; OR-12358; ILS-5-72) Avail: NTIS CSCL 09/5
The project made a careful study of current and projected module design and the available means (both manual and automatic) of manufacturing these modules. The objectives were: (1) Define current module designs and establish future design trends; (2) List the equipment currently available for setting up facilities for mechanized fabrication and assembly of electronic modules; (3) Perform a cost analysis at various levels of production for manufacturing facilities with different degrees of mechanization; (4) Design an N/C work center with complete specifications, equipment, layout, and block flow diagrams. Low, medium, and high production levels were treated for a balanced line operaton; (5) Generate military specification information to allow assembly by mechanized equipment; (6) Develop a set of design guidelines for use by MICOM electronic module suppliers; (7) Establish process problem areas of present module systems; (8) Forecast the direction of technological advance and the problem areas that might be encountered; (9) Prepare a set of manufacturing process and workmanship guidelines covering the production of planar printed wiring modules. (Modified author abstract)
GRA

N74-16159# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
ESTABLISHMENT OF TIGHTENING TORQUE VALUES FOR MS FLARELESS FLUID CONNECTORS
Adolf Bold 20 Sep. 1973 13 p refs
(AD-768746; NADC-73203-30) Avail: NTIS CSCL 13/8
Repeated assembly tests confirmed validity of existing torque values in MS33566 for use on CRES tubing and established new torque values for use on aluminum alloy tubing of various wall thicknesses.
Author (GRA)

N74-16160# Florida State Univ., Tallahassee. Dept. of Statistics.
RELIABILITY GROWTH Interim Report
Frank Proschan Sep. 1973 26 p refs
(Grant AF-AFOSR-2581-74; AF Proj. 9769)
(AD-768594; FSU-Statistics-M271; AFOSR-73-1910TR; TR-13) Avail: NTIS CSCL 14/4

In the paper, the author discusses, interprets, and illustrates the Birnbaum measure of the importance of each component in a coherent system. It is shown how this measure of component importance can be used to determine system reliability growth from component reliability growth. Finally, an algorithm is illustrated to calculate the optimum amount of effort to expend on improving individual component reliabilities so as to achieve a desired system reliability growth at minimum total cost for reliability growth. (Modified author abstract) GRA

N74-16161# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
LIQUID HELIUM PUMPS Summary Report, May - Dec. 1972
Philip M. McConnell Jun. 1973 91 p refs Sponsored by AFAPL
(AD-769542; NBSIR-73-316; AFAPL-TR-73-72) Avail: NTIS CSCL 13/11

The report summarizes studies of pump characteristics and performance in supercritical, normally boiling, and superfluid helium, and also presents results on a survey of commercially available pumps for helium service. Experimental measurements were made on a centrifugal pump which produced a maximum head of about 15 meters, and a maximum flow of about 0.00025 cu m/s. Performance agreed approximately with classical affinity laws, but cavitation appeared to provide less of a performance limitation than expected. The survey turned up several pumps which have been used in helium, though relevant performance data is lacking. Author (GRA)

N74-16162# Defense Documentation Center, Alexandria, Va.
TECHNIQUES IN PLATING Report Bibliography, Mar. 1957 - Jun. 1973
Nov. 1973 482 p refs
(AD-769400; DDC-TAS-73-64) Avail: NTIS CSCL 13/8

The bibliography is a collection of references relating to techniques in plating and coating. The references deal primarily with types of plating, materials used for plating, and plated surface. Also, the mechanical properties of deposited protective coatings are discussed. Corporate Author-Monitoring Agency, Subject, Title and Personal Author Indexes are included. GRA

N74-16163# Air Force Weapons Lab., Kirtland AFB, N.Mex.
EPOXY CANISTER DEVELOPMENT AND FABRICATION TECHNIQUES Technical Report, Jul. 1971 - Dec. 1972
David J. Fogelson Oct. 1973 41 p refs
(AF Proj. 1088)
(AD-769339; AFWL-TR-73-191) Avail: NTIS CSCL 13/4

During the high explosive simulation testing and follow-on programs, it was determined that the aluminum canisters used for free-field media motion transducers had many discrepancies which limited the data and, thus, the canister usefulness. Therefore, a program was initiated to evaluate these canister designs and to propose changes or new designs; the criteria being higher natural frequency, waterproof assembly, and improved canister/soil matching. In-house research produced the idea of a room temperature curing canister. After a thorough testing program, it was determined that the use of epoxy canisters was a breakthrough in the design of canisters for free-field ground motion transducers. This new design resulted in higher quality data at a greatly reduced cost. The testing program and fabrication techniques are discussed. (Modified author abstract) GRA

N74-16164# Air Force Packaging Evaluation Agency, Wright-Patterson AFB, Ohio.
EVALUATION AND REDESIGN OF FAA ALTIMETER PACK
Randle E. Dukes Oct. 1973 21 p
(AD-769540; DSPT-73-56) Avail: NTIS CSCL 13/4

The Federal Aviation Administration (FAA) has experienced an unacceptable damage rate (33%) in shipment of Station Altimeters. This item represents a cost of $344.00 per unit. Due to a pending contract to purchase 300 new units, plus normal shipments of 200 per year, FAA requested an immediate interim solution to the problem, to be followed by a final package design optimizing shock protection while reducing weight, cube, and cost. Author (GRA)

N74-16165# Army Materials and Mechanics Research Center, Watertown, Mass.
HIGH ENERGY BONDING OF LEAD-STEEL COMPOSITES
Robert M. Colton Mar. 1973 45 p refs
(AD-769733; AMMRC-TR-73-13) Avail: NTIS CSCL 13/8

Effects of stand-off distance and explosive charge thickness on bond integrity for high energy bonded lead-steel composites were determined using chemical lead type 'B' at 1/8 in. thickness, clad onto 1020 type steel at 1/4 in. thickness. Bond integrity was evaluated using chisel, bend, tensile-shear and metallographic techniques. Effect of explosive thickness on detonation velocity and propagation characteristics for a low velocity granular type (Carrifrax NE 1331) explosive were determined. Optimum procedure for high energy bonding of lead-steel composites is outlined. State-of-the-Art for high energy forming and bonding in the United Kingdom and West Germany is reviewed. Author (GRA)

N74-16166# Massachusetts Inst. of Tech., Cambridge. Materials Processing Lab.
WEAR PARTICLE FORMATION MECHANISMS Annual Report, Sep. 1972 - Sep. 1973
Harry Koba, Nathan H. Cook, and Deep C. Joshi Sep. 1973 76 p refs
(Contract N00014-67-A-0204-0054; NR Proj. 229-003)
(AD-769775) Avail: NTIS CSCL 11/6

The report describes the wear found in a lightly loaded, short duration, lubricated bronze on steel sliding system. Examination with a scanning electron microscope indicates that the surface of both bronze and steel are capable of very large plastic deformation. Evidence of a void formation/crack propagation mechanism, operating below the surface to produce loose wear particles was found. Wear particles precipitated out of the lubrication oil by a Ferrograph Analyzer and examined under high magnification showed considerable difference in size and shape to those which have been reported in the literature. Particle shape correlated well with a sub-surface void formation/crack propagation mechanism. A material transfer process of bronze to steel was found to be inconsistent with that predicted by the adhesion wear theory. Appendix one contains a progress report on the analysis of sliding contact of rough surface. (Modified author abstract) GRA

N74-16167# Naval Air Engineering Center, Philadelphia, Pa. Ground Support Equipment Dept.
ULTRASONIC CLEANING TECHNOLOGY
J. Hryhorec and John M. McCullough Aug. 1973 105 p refs
(AD-769267; NAEC-GSED-71) Avail: NTIS CSCL 13/8

A study was made of ultrasonic cleaning technology, Navy cleaners and problems encountered with the cleaners. A quantitative method for measuring the sonic energy in a cleaning tank was developed. A laboratory model of a general purpose ultrasonic cleaner was evaluated. Author (GRA)

N74-16168# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A STUDY OF THE FREQUENCY DISTRIBUTION OF THE TIME-TO-FAILURE FOR SIXTEEN MEASUREMENT FUNCTIONS OF THE 260 AFP-1 (SIMPSON) MULTIMETER M.S. Thesis
Robert M. Martin, III and Joel A. Carroll Aug. 1973 120 p refs
(AD-769185; SLSR-10-73B) Avail: NTIS CSCL 15/5

Present Air Force procedure for determining calibration intervals for precision measurement equipment (PME) is based on a formula for the normal probability density distribution. The Air Force assumes that the frequency distribution of the time-to-failure, or drift to an out-of-tolerance condition, of precision measurement equipment follows the normal probability distribution. This assumption is made without any factual evidence as to the actual distribution of PME failures with respect to time.

Until empirical evidence of a particular distribution is found, efforts to optimize calibration intervals will be fruitless. This research effort investigated the time-to-failure, or drift away from a calibrated position, of 16 functions of a type of precision measurement equipment, a multimeter. The objective was to determine if the time-to-failure of each function followed the normal distribution. GRA

N74-16169# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A DETERMINATION OF THE ISSUES OF A CONVERSION TO THE USE OF THE METRIC SYSTEM IN THE UNITED STATES AND AN ANALYSIS OF THESE ISSUES FOR BIAS ON THE PART OF GOVERNMENT AND INDUSTRIAL PUBLICATIONS M.S. Thesis
Robert A. Forrest and James F. Rogers, II Aug. 1973 127 p refs
(AD-769192; SLSR-13-73B) Avail: NTIS CSCL 14/2

Investigation has determined that the United States will eventually convert to the metric system but a problem arises as to how it will convert. The report is concerned with evaluating the opinions presented concerning a conversion to the metric system of measurement. It is intended to be a basis for knowing what the issues of a conversion to the metric system are, how they are presented by different segments of United States society, and if there is any bias for or against a conversion by any particular segment as presented in all types of written publications. GRA

N74-16170# Naval Postgraduate School, Monterey, Calif.
FAMILIES OF COMPONENTS, AND SYSTEMS, EXPOSED TO A COMPOUND POISSON DAMAGE PROCESS
J. D. Esary and A. W. Marshall Jul. 1973 21 p refs Presented at Conf. on Reliability and Biometry, Tallahassee, 9-27 Jul. 1973 Sponsored in part by NSF
(AD-769402; NPS-55EY73071A) Avail: NTIS CSCL 14/4

A fairly common failure model in a wide variety of contexts is a cumulative damage process, in which shocks occur randomly in time and associated with each shock there is a random amount of damage which adds to previously incurred damage until a breaking threshold is reached. The multivariate life distributions that are induced when several components, each with its own breaking threshold, are exposed to the same cumulative damage process are of interest in their own right, and are important examples in the general study of multivariate life distributions. The paper is a summary of some results about the very special, but central, case in which the cumulative damage process is a compound Poisson process. It is focused on the multivariate life distributions that arise when the component breaking thresholds are random and have a Marshall-Olkin multivariate exponential distribution. The results have application to the life distribution of a coherent system whose components are exposed to the damage process. (Modified author abstract) GRA

N74-16171# Naval Postgraduate School, Monterey, Calif.
PROPERTIES OF AN APPROXIMATE HAZARD TRANSFORM
J. D. Esary and W. J. Hayne Sep. 1973 28 p refs
(NR Proj. 042-300)
(AD-769401; NPS-55EY73091A) Avail: NTIS CSCL 14/4

The calculation of the exact reliability of complex systems is a difficult and tedious task. Consequently simple approximating techniques have great practical value. The hazard transform of a system is an invertible transformation of its reliability function which is convenient and useful in both applied and theoretical reliability work. A simple calculus for finding an approximate hazard transform for systems formed by series and parallel combinations of components is extended so that it can be used for any coherent system. The extended calculus is shown to lead to conservative approximations. A first order version of the extended calculus is also discussed. This method of approximation is even more simple to use, but is not always conservative. Examples of its application indicate that it is capable of giving quite accurate results. Author (GRA)

N74-16172# Wisconsin Univ., Madison. Dept. of Statistics.
LIFE TESTING AND RELIABILITY WITH APPLICATIONS TO ENGINEERING SYSTEMS Final Report, 1 Sep. 1969 - 30 Sep. 1973
Richard A. Johnson 30 Sep. 1973 13 p refs
(Grant AF-AFOSR-1789-69; AF Proj. 9769)
(AD-769300; AFOSR-73-1978TR) Avail: NTIS CSCL 14/4

The research concentrated on the development of statistical models and methods for life testing and reliability studies. A majority of the manuscripts are concerned with the development of statistical procedures which perform well for a wide class of distributions and require only a minimum of assumptions. Both complete and censored sample procedures were treated with emphasis on the latter because of their importance in life testing. A second major area covered in the investigation dealt with models and procedures for multicomponent systems when the components do not fail independently. Author (GRA)

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N74-16173 Georgetown Univ., Washington, D.C.
ELECTRO-OPTIC PSEUDO-STANDING WAVE TECHNIQUES IN FM LASER COMMUNICATIONS Ph.D. Thesis
Gerald Michael Borsuk 1972 195 p
Avail: Univ. Microfilms Order No. 73-26971

The analysis of the pseudo-standing wave electro-optic diffraction technique is presented. The analysis evaluates the application of the technique to wide bandwidth FM laser communications. A classical diffraction theory is presented that accurately describes the microwave-light interaction in nonlinear materials. Bandwidth capability of the technique is also analyzed. Materials parameters associated with oxygen-octahedra ferroelectrics are derived and related to the modulation technique. These parameters equations allow results to be calculated for some oxygen-octahedra ferroelectrics. An analysis and comparison of the optical receiving process is given in detail. Finally, experimental results are presented. These results verify the pseudo-standing wave effect through an electro-optic interaction. Dissert. Abstr.

N74-16174 Rochester Univ., N.Y.
A STUDY OF LASER BEAM CORRELATIONS NEAR THRESHOLD Ph.D. Thesis
Subhash Chopra 1973 111 p
Avail: Univ. Microfilms Order No. 73-25800

The stationary optical fields investigated were those produced by a single mode He:Ne gas laser operated over a substantial range about and including its threshold of oscillation. The operating point of the laser was stabilized at any arbitrary level by use of a feedback arrangement that controlled the cavity length and therefore the atomic gain. The form and decay time of the intensity correlation function of the laser beam were measured with the help of a time to amplitude converter. The experiments were performed at several predetermined values of the laser pump parameter a, ranging from $a = -1$ to $a = 4$. The initial fall-off time of the correlation function was determined directly from the experiment and after conversion to dimensionless units was compared with the theoretical values, given by the nonlinear oscillator theory of the laser. Dissert. Abstr.

N74-16175 California Inst. of Tech., Pasadena.
THEORETICAL AND EXPERIMENTAL INVESTIGATIONS OF SATURATION EFFECTS IN A GAS LASER Ph.D. Thesis
Hisatoshi Maeda 1973 187 p
Avail: Univ. Microfilms Order No. 73-26470

Theoretical studies of standing and traveling wave lasers are presented. The spectral behavior of the amplified spontaneous emission (superradiance) in a pencil-shaped column is investigated theoretically and experimentally. Spectral narrowing followed by rebroadening was observed as predicted by the theory. A geometrical representation of an interacting two-level atomic system was developed and applied to an optical laser. A semi-classical model for a standing wave laser was examined using the rotating wave approximation, and compared to the exact solution. Depth and width of the Lamb dip are determined theoretically and experimentally. The effect of radial profile of the laser field was studied using the self-consistent-field approach,

and the radius of the beam was measured at various positions from the window. Dissert. Abstr.

N74-16176 State Univ. of New York, Stony Brook.
RELATIVISTIC EFFECTS IN LASER/MOLECULAR BEAM INTERACTIONS Ph.D. Thesis
James Jacob Snyder 1973 125 p
Avail: Univ. Microfilms Order No. 73-25316

A method for measuring the relativistic second-order Doppler shift is described. The method uses the resonant absorption line of a molecular beam intersecting a folded, nonoverlapping laser beam. The nonlinear nature of resonant absorption causes an anomalous dip, similar to the Lamb dip, in the power absorbed by the molecular beam. The width of the anomalous dip is approximately the inverse of the time the molecules are in the incident and reflected laser beams, and may be much narrower than the full absorption line of the molecular beam.
Dissert. Abstr.

N74-16177 Minnesota Univ., Minneapolis.
SELF-MODE LOCKING IN INHOMOGENEOUSLY BROADENED CW LASERS Ph. D. Thesis
Gerald Raymond Willenbring 1973 142 p
Avail: Univ. Microfilms Order No. 73-25673

The framework of a new approach for analyzing self-mode locking in multimode CW gas lasers is presented. The average saturated gain profile is assumed to be nearly flat in the frequency range of the oscillating modes because the homogeneous pressure-broadened linewidth is larger than the intermode frequency spacing. Estimates of the recovery time for the inversion density in a He-Ne laser indicate that the gain variations are a few percent of the average gain. The third-order polarization sidebands generated by the gain variation at the intermode frequency interval are calculated under the assumption of small gain fluctuations. The concepts are developed using the polarization equations for a homogeneous two-level medium. The calculations are then extended to an inhomogeneously-broadened medium by using the dispersion calculations of Garside for a He-Ne laser. The results indicate that the primary effect of the sidebands is to change the phase velocity of the modes.
Dissert. Abstr.

N74-16178 British Broadcasting Corp., Kingswood (England). Research Div.
HOLOGRAPHY: A GENERAL SURVEY
E. W. Taylor Dec. 1973 26 p refs
(BBC-RD-1973/38) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The history of the development of holography is surveyed and an introduction to the general theory is given. Techniques for the preparation of holograms are described, and materials for use as holographic recording media are discussed. An extensive list of references is included. Author

N74-16179 British Broadcasting Corp., Kingswood (England). Research Dept.
RECORDING USE HOLOGRAM ARRAYS: A GENERAL SURVEY
E. W. Taylor Dec. 1973 13 p refs
(BBC-RD-1973/40) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The principles of digital holographic recording are discussed. The application of analog recording and digital recording of holograms and the characteristics of transmission paths are described. The practical considerations are analyzed on the basis of: (1) optical arrangements, (2) sequential recording and playback of individual holograms, (3) size and storage capacity of individual holograms, and (4) feasibility of implementing a holographic digital recording system. A comparison of holographic and other proposed digital recording systems is included.
Author

N74-16180 British Broadcasting Corp., Kingswood (England). Research Dept.
DIGITAL RECORDING USING HOLOGRAM ARRAYS: LOW-FREQUENCY MICRO-HOLOGRAMS ON PHOTOGRAPHIC FILM
K. Hacking Jan. 1974 19 p refs
(BBC-RD-1973/41) Avail: BBC, Kingswood Warren, Tadworth, Surrey, England

The recording of small (micro) holograms, representing words of binary-coded information, on conventional photographic film, is examined along with the subsequent retrieval of this information. The work is the initial phase of a feasibility study of a possible system for recording digital television signals in real-time using laserbeam scanning combined with holographic techniques. A theoretical analysis of holographic image formation is followed by the results of basic experiments and measurements and measurements on several film emulsions. The results show that binary storage densities of approximately 1 million bits/sq cm are feasible with average signal to interference ratios of 20 db or better after reconstruction, and with hologram spatial bandwidths of less than 200 cycles/mm. At this storage density or greater, recording and replay could be achieved using laser radiation powers of less than 10 mW, assuming an optical efficiency greater than 10%. Author

N74-16181 American Univ., Washington, D.C.
TIME-RESOLVED SPECTRAL OUTPUT OF A DOUBLY RESONANT, OPTICAL PARAMETRIC OSCILLATOR, PUMPED BY A CW LASER PH.D. Thesis
Joseph Forrest Weller 1973 116 p
Avail: Univ. Microfilms Order No. 73-28824

The time-resolved spectral output of a doubly resonant oscillator pumped by a CW laser is considered. The oscillator consists of a Ba2NaNb5O15 crystal in a hemispherical cavity of 5.0 cm length. An argon laser operating at 5145 A in a single longitudinal and transverse mode is the pump radiation. Mirrors for the oscillator are coated for operation near degeneracy in the 1.0 micron spectral region. The oscillator output is analyzed with a 1.0 m spectrometer and a streak camera. The experimental results show that for pump powers just above threshold, the doubly resonant oscillator operates on a single cluster of modes for the duration of one scan. The width of the cluster varies depending on the vibrations present; cluster widths approaching the resolution of the system can be observed on some scans. Multiple exposures though indicate that vibrations and pump instabilities cause the oscillator to operate over most of the fluorescence bandwidth. Dissert. Abstr.

N74-16182*# Smithsonian Astrophysical Observatory, Cambridge, Mass. Center for Astrophysics.
THE STATISTICS OF LASER RETURNS FROM CUBE-CORNER ARRAYS ON SATELLITE
C. G. Lehr Sep. 1973 17 p refs Prepared in cooperation with Harvard Coll. Obs., Cambridge, Mass.
(Grant NGR-09-015-002)
(NASA-CR-136731; SAO-Laser-Rept-5) Avail: NTIS HC $3.00 CSCL 20E

A method first presented by Goodman is used to derive an equation for the statistical effects associated with laser returns from satellites having retroreflecting arrays of cube corners. The effect of the distribution on the returns of a satellite-tracking system is illustrated by a computation based on randomly generated numbers. Author

N74-16183*# Rensselaer Polytechnic Inst., Troy, N.Y. School of Engineering.
LASER SCANNING METHODS AND A PHASE COMPARISON, MODULATED LASER RANGE FINDER FOR TERRAIN SENSING ON A MARS ROVING VEHICLE M.S. Thesis
Glenn T. Herb May 1973 51 p refs
(Grant NGL-33-018-091)
(NASA-CR-136774; RPI-TR-MP-34) Avail: NTIS HC $4.75 CSCL 20E

Two areas of a laser range finder for a Mars roving vehicle are investigated: (1) laser scanning systems, and (2) range finder methods and implementation. Several ways of rapidly scanning a laser are studied. Two digital deflectors and a matrix of laser diodes, are found to be acceptable. A complete range finder scanning system of high accuracy is proposed. The problem of incident laser spot distortion on the terrain is discussed. The instrumentation for a phase comparison, modulated laser range finder is developed and sections of it are tested. Author

N74-16184*# Rensselaer Polytechnic Inst., Troy, N.Y. School of Engineering.
DESIGN OF A LASER RANGEFINDER FOR MARTIAN TERRAIN MEASUREMENTS M.S. Thesis
Daniel L. Palumbo May 1973 56 p refs
(Grant NGL-33-018-091)
(NASA-CR-136775; RPI-TR-MP-37) Avail: NTIS HC $5.00 CSCL 20E

Three methods for using a laser for rangefinding are discussed: optical focusing, the phase difference method, and timed pulse. For application on a Mars Rover, the timed pulse method proves to be the better choice in view of the requirements set down. This is made possible by pulse expansion techniques described in detail. Initial steps taken toward building the range finder are given, followed by a conclusion. Author

N74-16185# Defence Research Establishment Valcartier (Quebec).
PRELIMINARY STUDY OF AN HBr CHEMICAL LASER
T. V. Jacobson and D. R. Snelling Nov. 1973 10 p refs
(DREV Proj. 97-01-39)
(DREV-TN-2087/73) Avail: NTIS HC $3.00

An HBr chemical laser initiated by a transverse electrical discharge was constructed and studied. Up to 20 mJ of laser radiation at 4.3 microns were produced by sparking mixtures of Ar, H2, and Br2. Suggestions to improve the performance of the laser are given. Author

N74-16186# Defence Standards Labs., Maribyrnong (Australia).
THEORETICAL STUDIES OF THE INTERACTION BETWEEN 10.6MUm RADIATION AND NON-METALS
B. C. H. Wendlandt Nov. 1973 12 p refs
(TN-318) Avail: NTIS HC $3.00

The power density required from a 10.6 micron laser beam to damage nonmetals is estimated. The calculations are based on the heat transfer theories of classical physics. Author

N74-16187*# National Aeronautics and Space Administration. Pasadena Office, Calif.
INERT GAS METALLIC VAPOR LASER Patent Application
Gary R. Russell (JPL), Noble M. Nerheim (JPL), and Thomas J. Pivirotto, inventors (to NASA) (JPL) Filed 3 Dec. 1973 23 p
(Contract NAS7-100)
(NASA-Case-NPO-13449-1; US-Patent-Appl-SN-420813) Avail: NTIS HC $3.25 CSCL 20E

A gas laser which uses a mixture of inert gases and metallic vapors as the lasing material was developed. The laser operates in a pulsed mode to provide high average power output. Copper vapor and an inert gas, such as argon or helium, are pulsed by electrodes which receive power from an appropriate pulsed power supply. The laser also includes a pair of mirrors which are spaced apart along an axis defined as the cavity axis about which the electrodes are aligned. The lasing mixture flows in a direction perpendicular to the cavity axis and the current flow direction between the two electrodes. NASA

N74-16188# Defence Standards Labs., Maribyrnong (Australia).
THEORETICAL STUDIES OF THE INTERACTION OF HIGH POWER LASER BEAMS AND METALS
B. C. H. Wendlandt May 1973 126 p refs
(Rept-547) Avail: NTIS HC $8.50

The behaviour of metals subjected to intense 10.6 micron laser radiation is calculated. The various mechanisms by which a metal sheet could be damaged are examined and, for each mechanism, calculations are carried out to find the energy required to pierce the sheet. The ionization of the air and vapour products, and the energy absorbed by these processes are also calculated in order to determine the total energy required to damage a metal plate. Author

N74-16189# Physical Research Lab., Ahmedabad (India).
A RESONANT ABSORPTION METHOD OF LASER MODULATION
Abhijit Sen and Predhiman Kaw 1973 7 p refs Submitted for publication
(AER-73-10) Avail: NTIS HC $3.00

A method of laser modulation which depends on certain plasma effects in semiconductors is discussed. In the presence of low frequency background noise, an incident electromagnetic wave near the plasma frequency, may be anomalously absorbed because it puts energy into damped electrostatic plasma waves. This anomalous absorption process is highly resonant and requires near matching of the incident wave frequency and the frequency of the excited plasma waves. If the frequency of the electron plasma waves is shifted in and out of resonance by a modulating agency, the absorption coefficient can get strongly modulated leading to amplitude modulation of the electromagnetic wave. The frequency shift can be achieved by the application of suitable electric fields to the semiconductor. Author

N74-16190*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHANNEL SIMULATION FOR DIRECT DETECTION OPTICAL COMMUNICATION SYSTEMS
M. Tycz and M. W. Fitzmaurice Nov. 1974 26 p refs
(NASA-TM-X-70562; X-524-73-377) Avail: NTIS HC $3.50 CSCL 20E

A technique is described for simulating the random modulation imposed by atmospheric scintillation and transmitter pointing jitter on a direct detection optical communication system. The system is capable of providing signal fading statistics which obey log normal, beta, Rayleigh, Ricean or chi-squared density functions. Experimental tests of the performance of the Channel Simulator are presented. Author

N74-16191*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CHARACTERISTICS OF ADVANCED HYDROGEN MASER FREQUENCY STANDARDS
Harry E. Peters Dec. 1973 34 p refs Submitted for publication
(NASA-TM-X-70579; X-524-74-15) Avail: NTIS HC $3.75 CSCL 20E

Measurements with several operational atomic hydrogen maser standards have been made which illustrate the fundamental characteristics of the maser as well as the analysability of the corrections which are made to relate the oscillation frequency to the free, unperturbed, hydrogen standard transition frequency. Sources of the most important perturbations, and the magnitude of the associated errors, are discussed. A variable volume storage bulb hydrogen maser is also illustrated which can provide on the order of 2 parts in 10 to the 14th power or better accuracy in evaluating the wall shift. Since the other basic error sources combined contribute no more than approximately 1 part in 10 to the 14th power uncertainty, the variable volume storage bulb hydrogen maser will have net intrinsic accuracy capability of the order of 2 parts in 10 to the 14th power or better. This is an order of magnitude less error than anticipated with cesium standards and is comparable to the basic limit expected for a free atom hydrogen beam resonance standard. Author

N74-16192# Naval Postgraduate School, Monterey, Calif.
THE WAVELENGTH SPECTRUM SHIFT OF A CAVITY-DUMPED ARGON LASER-PUMPED RHODAMINE 6-G ORGANIC-DYE LASER M.S. Thesis
Gerald Warner Snyder Sep. 1973 60 p refs
(AD-769280) Avail: NTIS CSCL 20/5

The wavelength spectrum of a CW pumped Rhodamine 6-G organic dye laser is observed to shift approximately 150 Angstroms toward shorter wavelengths when pumped by 30 nsec pulses at a one megahertz repetition rate from a cavity-dumped Argon laser. Experimental evidence of the shift is presented, gain and rate equations are developed for a simplified dye laser model, and theoretical results are obtained for a computer simulation of the experimental results and satisfactory agreement is obtained within the limits of the values of the parameters used and the assumptions made in formulating the model. Author (GRA)

N74-16193# Naval Research Lab., Washington, D.C.
X-RAY LASERS-CURRENT THINKING
R. A. Andrews Oct. 1973 16 p refs
(NRL Proj. N01-33)
(AD-769461; NRL-MR-2677) Avail: NTIS CSCL 20/5

The report is a summary of the discussion presented at a

symposium on X-ray lasers held in Washington, D.C., on 29 May 1973. The consensus reached is that (1) X-ray lasers in the 1 keV range are possible with existing technology, (2) well defined experiments are lacking, and (3) there are large areas of application in particular areas related to materials sciences. (Modified author abstract) GRA

N74-16194# Army Missile Command, Redstone Arsenal, Ala. Propulsion Directorate.
CHEMICAL LASER FLOW SIMULATION AND MIXING STUDIES USING HOLOGRAPHIC FLOW VISUALIZATION TECHNIQUES
C. R. Wimberly, L. B. Thorn, and G. W. Butler 28 Aug. 1973 42 p refs
(AD-769597; RK-73-14) Avail: NTIS CSCL 20/5

This report is a summary of work directed toward an understanding of mixing processes in the reaction cavity of a chemical laser device. Holographic optical techniques are used to visualize the flow of gases exiting from an array of supersonic nozzles in a cold flow simulation of the chemical laser. The reconstructed holograms are used to evaluate the mixing process as a function of thermodynamic parameters, flow obstructions, and mass injection mechanisms. Analysis of the mixing is discussed and related to the flow conditions illustrated by shadowgrams, schlieren, and interferograms. Some conclusions are drawn with respect to factors that affect the mixing process. Author (GRA)

N74-16195# Rochester Univ., N.Y. Dept. of Physics and Astronomy.
PROPERTIES AND INTERACTIONS OF COHERENT RADIATION Final Report, 1 Mar. 1969 - 30 Sep. 1973
L. Mandel Sep. 1973 26 p refs
(Contract F44620-69-C-0086; AF Proj. 9751)
(AD-769443; AFOSR-73-1984TR) Avail: NTIS CSCL 20/5

The research under the contract included work on interference of photons, coherence properties of optical fields, new techniques for photoelectric correlation measurements, lasers and dynamics of lasers, evanescent photons, superradiance, and some experimental tests of quantum electrodynamics. (Modified author abstract) GRA

N74-16196# Oregon Graduate Center for Study and Research, Portland.
PROPAGATION OF MULTIWAVELENGTH LASER RADIATION THROUGH ATMOSPHERIC TURBULENCE Final Technical Report, 15 Jun. 1972 - 31 Aug. 1974
J. Richard Kerr Aug. 1973 78 p refs
(Contract F30602-72-C-0470; ARPA Order 1279)
(AD-769792; RADC-TR-73-322; Rept-1174-4) Avail: NTIS CSCL 20/6

The investigations on this program have included the measurement of multiwavelength scintillation statistics over a very long, highly turbulent path; the analytical and experimental study of finite-transmitter and wander-tracking effects on target irradiance; and the study of the detailed nature of microthermal turbulence fluctuations, including turbulent intermittency, as related to short-term scintillation statistics. The latter two areas represent ongoing efforts, and are reviewed in this report. Finite-beam experiments are being conducted with a wander-cancelling, tracking-transmitter over a 1.6 km, uniform path. A new prediction is given for the transverse amplitude correlation length under near field conditions in strong turbulence. Microthermal fluctuations due to turbulence are considered, and it is shown experimentally that the statistics of appropriately averaged first-increments or derivatives behave in accordance with recent theoretical predictions. (Modified author abstract) GRA

N74-16197# Harry Diamond Labs., Washington, D.C.
LASER RELATED STUDY OF TRIPLY IONIZED PROMETHIUM IN LiYF4
Donald E. Wortman and Clyde A. Morrison Sep. 1973 27 p refs
(AD-769589; HDL-TR-1641) Avail: NTIS CSCL 07/4

Radiative transition probabilities have been computed for the relaxation of the metastable quintuplet F energy levels of Pm(3-) in single-crystal LiYF4. The crystal-field-split quintuplet F and quintuplet I energy levels were also determined. The sum of the relative intensities of the optical transition between the quintuplet F(1) and quintuplet I(5) multiplets for Pm(3-) in LiYF4 is even stronger than that computed by Krupke for Pm(3-) in YAG, in work favorably comparing possible laser action for Pm(3-) in YAG with that for Nd(3-) in YAG. In addition, it was found that almost all the Pm(147) nuclear radiation would be trapped in the crystal, and the optical properties of the crystal in the 0.94-micrometer wavelength region (where laser action might occur) might not be harmed. However, energy transfer between Pm(3-) and the impurity ions Sm(3-) and Nd(3-), which will also be in the crystal, is likely to quench any Pm(3-) fluorescence at about 0.94-micrometer and prevent the use of Pm(3-) as a laser ion. (Modified author abstract) GRA

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N74-16198 British Library Lending Div., Boston Spa (England).
ANISOTROPY IN SUPERPLASTIC FORMING OF ZINC ALUMINUM SHEET
U. Heubner et al [1973] 21 p refs Transl. into ENGLISH from Sonderdruck aus der Z. Metallk. (Stuttgart), v. 63, 1972 p 607-614 In ENGLISH and GERMAN
(BLL-M-23112-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 2 BLL photocopy coupons

In zinc-aluminum sheet of eutectoid composition (22 wt.% Al) and with a grain size of 0.9 micron, not only the anisotropy of the superplastic formability increases with increasing texture sharpness, but the superplastic formability as a whole increases. The textures change during the superplastic forming process. For example, when the initial structure is essentially irregular, a fiber texture develops in the zinc phase, which can be completely described as < 0001 > perpendicular to the direction of strain. In contrast, the texture of the aluminum phase becomes irregular during superplastic straining. The r-value is no direct measure of the superplastic formability. From the change of the r-values one can conclude that the texture changes with increasing superplastic strain. At first, the change is strong, and after 300 and up to 1000% strain, the change is slight. If the texture change leads to a small fraction of crystals which can no longer slip under the influence of an external shear stress because of their orientation (Schmid factor 0), then the amount of superplastic strain to fracture is large, and vice versa. Author

N74-16199 Drexel Univ., Philadelphia, Pa.
WATER ATOMIZATION OF 4620 STEEL AND OTHER METALS Ph.D. Thesis
Richard John Grandzol 1973 289 p
Avail: Univ. Microfilms Order No. 73-25531

The water atomization of liquid metals is described both experimentally and theoretically. Results of experiments using 4620 steel, 304 stainless steel, copper, a bismuth alloy, and cast iron are reported. The most important atomization variable is water jet velocity; some influence of jet apex angle was noted. Liquid metal surface tension is found to have no influence on particle size but some influence on particle shape. Liquid metal density and viscosity appear to influence metal particle size. A theoretical model based on the transfer of momentum from water droplets to the metal particles formed satisfactorily describes the experimental data. The model does not describe the actual particle formation mechanism, but two mechanisms for use with the model are proposed. Methods for future work in water atomization of liquid metals are recommended. Dissert. Abstr.

N74-16200 Rensselaer Polytechnic Inst., Troy, N.Y.
THE STRENGTH DIFFERENTIAL EFFECT IN MARAGING STEELS Ph.D. Thesis
Thirumaleshwara Alangar Bhat 1973 63 p
Avail: Univ. Microfilms Order No. 73-25909

The plastic flow curves of three commercial grades of

18 Ni-Co-Mo-Ti-Al maraging steels (250, 300, and 350 grades) were studied in tension and in compression in the following conditions: (1) solution annealed, and water quenched (except for the 250 grade), (2) solution annealed, and air cooled, (3) solution annealed, air cooled, and then aged at 800 F for 3 hours (underaged), (4) solution annealed, air cooled, and then aged at 950 F for 3 hours (optimum or near optimum aged), and (5) solution annealed, air cooled, and then aged at 1100 F for 3 hours (overaged). The strength differential phenomena revealed by the mechanical tests were related to the structures of deformed and undeformed alloys, as determined by transmission electron microscopy, electron diffraction, and electron fractography. These observations were analysed in the light of existing theories of the SD effect. Dissert. Abstr.

N74-16201 Ohio State Univ., Columbus.
GRAVIMETRIC ANALYSIS OF THE AUSTENITE/FERRITE TRANSFORMATION IN IRON AND IRON-MOLYBDENUM ALLOYS Ph.D. Thesis
James Richard Eifert 1973 227 p
Avail: Univ. Microfilms Order No. 73-26806

A set of equations was developed to describe the carburization and decarburization process in a finite size, multiphase specimen with a moving interface. An apparatus was designed that allowed monitoring of the weight change of the specimens during the entire course of the experiments. Computer programs were written to compute the theoretical weight gain/loss for comparison with the experimentally determined weight gain/loss. A correlation between the alpha/gamma interface position and the weight gained or lost by an iron specimen during carburization or decarburization was demonstrated. In conjunction with this correlation, indirect proof of the existence of nonequilibrium interface compositions at the moving alpha/gamma interface was presented. Some additional data was obtained on the appearance of island gamma regions ahead of a moving interface during the carburization of iron-molybdenum alloys. Dissert. Abstr.

N74-16202 Rutgers Univ., New Brunswick, N.J.
PHASE RELATIONS AND MECHANICAL PROPERTIES OF Ti-Mo-Al ALLOYS Ph.D. Thesis
Takashi Hamajima 1973 119 p
Avail: Univ. Microfilms Order No. 73-27934

Microstructures and phase relations were investigated for the titanium rich composition of the Ti-Mo-Al system. It was found that the four phase equilibrium beta(b.c.c.) + Ti3Al Mo reversable reaction alpha(h.c.p.) + beta 2(B2, Ti2-MoAl) exists at a temperature of about 550 C. Above this temperature, a two phase region namely a beta + Ti3Al region exists. Beta transus (the beta/beta + Ti3Al temperature) increases with increase of aluminum content and the two phase region extends, on the isopleth of the phase diagram at 7 at.%Mo, from 900 C for 7 at.%Mo-12 at%Al to 1300 C for 7 at.%Mo-24 at. %Al. From a practical view point, it was found that alloys with a beta +Ti3Al microstructure have high yield stress and good ductility when the volume fraction of Ti3Al phase is low and when precipitation of coherent particles is suppressed. It was also shown that the alloy does not lose its good mechanical properties by aging at intermediate temperatures. Dissert. Abstr.

N74-16203 Notre Dame Univ., Ind.
AN INVESTIGATION OF THE SWELLING BEHAVIOR OF SELECTED STAINLESS STEELS DURING HEAVY ION IRRADIATION Ph.D. Thesis
Samuel Gilbert McDonald, III 1973 130 p
Avail: Univ. Mirofilms Order No. 73-24328

A series of austenitic stainless steels were irradiated with 4MeV Ni-58(+) ions in order to simulate the high dose exposures which will be encountered in full-scale LMFBR's. The swelling behavior of Type 304 was characterized as a function of ion dose at 600 C and 525 C, while the swelling behavior of Type 316 was characterized as a function of ion dose at 525 C. Characterization included determination of mean void diameters, void number densities, void volume fractions, and dislocation densities. At 600 C, Type 304 swelled continuously with increasing dose, reaching void volume fractions of 0.5 or greater at 250 displacements/atom. At 525 C, Type 304 also swelled continuously with increasing dose, but void volume fractions were approximately an order of magnitude lower than those observed at 600 C. Type 316 exhibited swellings which were about a factor of two less than those observed in Type 304 at 525 C. Dissert. Abstr.

N74-16204 Rensselaer Polytechnic Inst., Troy, N.Y.
INTERGRANULAR ATTACK OF SENSITIZED AUSTENITIC STAINLESS STEEL IN AQUEOUS SOLUTIONS AT 289 C Ph.D. Thesis
Maurice Ezra Indig 1973 224 p
Avail: Univ. Microfilms Order No. 73-27215

Intergranular attack of sensitized austenitic stainless steel in aqueous solutions at 289 C was studied in a multidisciplined effort. The general approach has been to characterize the electrochemical and chemical conditions that exist in active grain boundary crevices. Electrochemical experiments with experimental alloys, similar in composition to the chromium depleted sensitized grain boundary regions, were conducted in various dilute acid solutions. These results were then applied to predict conditions of rapid intergranular attack on sensitized austenitic stainless steel. It was found that the amount of corrosion attack was a function of chromium composition, pH of the electrolyte, polarizing potential and the previous metallurgical history (cold worked or annealed). Analysis of experimental results in static autoclaves had shown that changes in electrolyte chemistry significantly altered the anodic polarization curves of the alloys used in these studies. For this reason it was found necessary to build a circulating system where electrolyte purity was maintained. Dissert. Abstr.

N74-16205 Rensselaer Polytechnic Inst., Troy, N.Y.
TENSILE PROPERTIES OF ULTRA HIGH PURITY IRON AND IRON CHROMIUM ALLOYS Ph.D. Thesis
Michael Joan Kelly 1973 192 p
Avail: Univ. Microfilms Order No. 73-27216

The dependence of the tensile properties of ferrite on temperature, substitutional alloy addition (chromium) and microstructure has been investigated. Effects of interstitials were minimized through their removal by a specially constructed purification system. Slip character was observed by optical and transmission electron microscopy. It was found that chromium produced softening in recrystallized (20 micron grain size) material below room temperature; the ductile to brittle transition temperature of this material lay between 112 K and 78 K for all solute levels. Interstitial content was reduced through a series of anneals in wet hydrogen followed by ZrH2 purified H2. Purity was determined by combustion methods for C, micro-Kjeldahl for N and neutron activation for O. Resistivity ratio measurements (300 K/4.2 K) were used to estimate purity beyond the range of conventional methods. Observations of mechanical behavior support these assessments of purity. Dissert. Abstr.

N74-16206+ Hydromecanique et Frottement, Andrezieux (France).
TITANIUM FRICTION Final Report [FROTTEMENT DE TITANE]
M. Caubet Jan. 1973 56 p In FRENCH
(Contract DGRST-69-0-1936)
Avail: NTIS HC $5.00

Antiwear, antiseizing surface treatment for Ti alloys are studied. TA6V alloy was specifically used. Sn/Ti interdiffusion results yield a procedure which is detailed. Such a procedure solves the friction problem, but induces a sensitivity to rotating flextion strains. Other results are: (1) below 650 C, TA6V is not wetted by Sn; (2) Sn/TA6V interdiffusion appears at temperatures higher than 800 C and induces a retrodiffusion of Al; (3) at 600 C there is a deep diffusion of Al and Cu in TA6V and a partial diffusion of Fe, Ni, Cu, Au; and (4) there is good friction between Ti 6 Sn 5 and steel, while Ti 3 Sn is abrasive. ESRO

N74-16207# National Aeronautical Lab., Bangalore (India).
PHYSICO-MECHANICAL STATE OF THE SURFACE LAYER OF PARTS OF HARD ALLOYS AFTER ELECTRO-SPARK TREATMENT
I. I. Mukhanov, V. N. Filimonenko, and B. Kh. Pivovarov Jan. 1972 12 p refs Transl. into ENGLISH from Akad. Nauk Ukr. SSR, Fiz.-Khim. Mekhan. Materialov (Ukraina SSR), v. 6, no. 6, 1970 p 3-6

(NAL-TR-103) Avail: NTIS HC $3.00

Results are given on the physiomechanical state of parts of hard alloy surfaces, of the BK group, after treatment on electro-spark machines working in a RC generator. The experiments were conducted on a machine tool model 4 B 721. Metallographic investigation of the surface layer after electro-spark treatment revealed the presence of polished layers, which occurs even on those regimes when the crack is absent. Author

N74-16208# Joint Publications Research Service, Arlington, Va.

RADIATION SWELLING OF STEEL OKh18N9T

V. N. Bykov, A. G. Vakhtin, V. D. Dmitriyev, L. G. Kostromin, A. Ya. Ladygin, and V. I. Shcherbak 14 Jan. 1974 7 p refs Transl. into ENGLISH from At. Energ. (Moscow), v. 35, no. 4, 1973 p 235-237

(JPRS-60973) Avail: NTIS HC $3.00

The results of electron-microscopic analysis of the radiation porosity of OKh18N9T steel are presented. Author

N74-16209*# Mar-Test, Inc., Cincinnati, Ohio.

HIGH TEMPERATURE, LOW CYCLE FATIGUE OF COPPER-BASE ALLOYS IN ARGON. PART 3: ZIRCONIUM-COPPER; THERMAL-MECHANICAL STRAIN CYCLING, HOLD-TIME AND NOTCH FATIGUE RESULTS Contractor Report, Oct. - Dec. 1973

J. B. Conway, R. H. Stentz, and J. T. Berling Dec. 1973 52 p

(Contract NAS3-16753)

(NASA-CR-121261; MTI-R003-2-3) Avail: NTIS HC $4.75 CSCL 11F

The low-cycle fatigue characteristics of smooth bar and notched bar specimens (hourglass shape) of zirconium-copper, 1/2 Hard, material (R-2 Series) were evaluated at room temperature in axial strain control. Over the fatigue life range from about 300 to 3000 cycles the ratio of fatigue life for smooth bar to fatigue life for notched bar remained constant at a value of about 6.0. Some additional hold-time data for the R-2 alloy tested in argon at 538 C are reported. An analysis of the relaxation data obtained in these hold-time tests is also reported and it is shown that these data yield a fairly consistent correlation in terms of instantaneous stress rate divided by instantaneous stress. Two thermal-mechanical strain cycling tests were also performed using a cyclic frequency of 4.5 cycles per hour and a temperature cycling interval from 260 to 538 C. The fatigue life values in these tests were noticeably lower than that observed in isothermal tests at 538 C. Author

N74-16210# Aeronautical Research Labs., Melbourne (Australia).

SOME ABNORMALITIES IN THE FATIGUE BEHAVIOUR OF LOW-OXYGEN COPPER BAR

J. Y. Mann and R. B. Davies Jun. 1973 25 p refs

(ARL/SM-395) Avail: NTIS HC $3.25

Anomalous fatigue behavior was observed in certain bars taken from a batch of low-oxygen, low-phosphorus extruded copper bar; and a metallurgical investigation was undertaken to determine the cause of such behavior. Reductions in the fatigue life of abnormal compared with normal material were found to be associated with the segregation of impurities. Abnormal bars developed intercrystalline networks of cuprous oxide and copper phosphide inclusions during vacuum annealing, and these were responsible for the occurrence of intercrystalline fatigue fractures of characteristic appearance. These networks were also apparently responsible for a reduction in the values of the static tensile reduction of area of such bars in the annealed compared with the as-received condition. It is concluded that, because the differences in the fatigue strengths of abnormal and normal material were small, the fatigue strength of annealed copper is relatively insensitive to structural inhomogeneities. Author

N74-16211# Mitsubishi Heavy-Industries, Ltd., Tokyo (Japan).

STEREOSCOPIC ELECTRON MICROFRACTOGRAPHY OF CAST IRON

Jiro Kotani, Kaoru Myoga, and Shokichi Miyabayashi Nov. 1973 11 p refs

(MTB-88) Avail: NTIS HC $3.00

The development and application of a scanning electron microscope for electron microfractography of metal specimens are discussed. The microscope makes it possible to observe an uneven fracture surface directly in order to determine the causes of service failures in metallic materials. Flake graphite and modular graphite cast iron specimens were tested. The tests included stereoscopic observations of tensile, impact, and fatigue surfaces. The crack initiation and the crack path in tensile stress were predicted by a bending test. Author

N74-16212# Technische Univ., Berlin (West Germany). Fachbereich 6 fuer Physikalische und Angewandte Chemie.

HELIUM DIFFUSION IN A SILVER LITHIUM ALLOY AFTER NEUTRON IRRADIATION Ph.D. Thesis [DIFFUSION VON HELIUM IN EINER SILBER-LITHIUM-LEGIERUNG NACH NEUTRONENBESTRAHLUNG]

Klaus-Dieter Mirus 1972 94 p refs In GERMAN

Avail: NTIS HC $6.75

A helium concentration of 1.1 x 0.0001 at. % was obtained in lithium doped silver by the nuclear reaction Li-6(n,T)He-4. Continuous mass spectra of rare gas emission at 410 C to 809 C exhibited simultaneous processes of diffusion and trapping. Diffusion coefficients were determined from the temperature of the gaseous emission; they decreased at decreasing probe thickness and lower neutron dosage. It is concluded that the traps were radiation induced lattice defects. Transl. by G.G.

N74-16213# Technische Univ., Berlin (West Germany).

COMPARISON OF AMORPHOUS AND MELTED ALLOY STRUCTURES Ph.D. Thesis [VERGLEICH DER STRUKTUR VON AMORPHEN UND GESCHMOLZENEN LEGIERUNGEN]

Tilman Just 1973 75 p refs In GERMAN

Avail: NTIS HC $5.75

Radiographic analyses are reported on amorphous and liquid tellurium, palladium, gold, and aluminum alloys that contain 10 to 30 at. % silicon. Comparison of atomic scattering and distribution curves for amorphic metallic alloys with those from binary eutectic alloy melts confirm the hypothesis that metal atoms have a Bernal structure and that nonmetallic atoms pack into the larger interstices. The presence of low melt eutectics is explained by the stability of the Bernal structure in the same concentration phase where also glass formation is observed.

Transl. by G.G.

N74-16214*# McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.

EVALUATION OF DISPERSION STRENGTHENED NICKEL-BASE ALLOY HEAT SHIELDS FOR SPACE SHUTTLE APPLICATION Phase 1 Summary Report, 15 Jun. 1972 - 15 May 1973

R. Johnson, Jr. and D. H. Killpatrick May 1973 287 p refs (Contract NAS1-11654)

(NASA-CR-132360; MDC-G4705) Avail: NTIS HC $16.50 CSCL 11F

The work reported constitutes the first phase of a two-phase program. Vehicle environments having critical effects on the thermal protection system are defined; TD Ni-20Cr material characteristics are reviewed and compared with TD Ni-20Cr produced in previous development efforts; cyclic load, temperature, and pressure effects on TD Ni-20Cr sheet material are investigated; the effects of braze reinforcement in improving the efficiency of spotwelded, diffusion-bonded, or seam-welded joints are evaluated through tests of simple lap-shear joint samples; parametric studies of metallic radiative thermal protection systems are reported; and the design, instrumentation, and testing of full-scale subsize heat shield panels are described. Tests of full-scale subsize panels included simulated meteoroid impact tests; simulated entry flight aerodynamic heating in an arc-heated plasma stream; programmed differential pressure loads and temperatures simulating mission conditions; and acoustic tests simulating sound levels experienced by heat shields during about boost flight. Test results are described, and the performances of two heat shield designs are compared and evaluated. Author

N74-16215*# TRW Equipment Labs., Cleveland, Ohio.

VACUUM THERMAL-MECHANICAL FATIGUE TESTING OF TWO IRON BASE HIGH TEMPERATURE ALLOYS Topical Report, 30 Jun. 1964 - 31 Dec. 1972

K. D. Sheffler 31 Jan. 1974 27 p refs
(Contract NAS3-6010)
(NASA-CR-13524; TRW-ER-7697; Rept-3) Avail: NTIS HC $3.50 CSCL 11F

Ultrahigh vacuum elevated temperature low cycle fatigue and thermal fatigue tests of 304 stainless steel and A-286 alloy have shown significant effects of frequency and combined temperature-strain cycling on fatigue life. At constant temperature, the cyclic life of both alloys was lower at lower frequencies. Combined temperature-strain cycling reduced fatigue life with respect to isothermal life at the maximum temperature of the thermal cycle. Life reductions with in-phase thermal cycling (tension at high temperature, compression at low temperature) were attributed to grain boundary cavitation caused by unreversed tensile grain boundary sliding. The proposed mechanism for out-of-phase cavity generation involved accumulation of unreversed compressive grain boundary displacements which could not be geometrically accomodated by intragranular deformation in the low-ductility A-286 alloy. Author

N74-16216*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH-VELOCITY-OXIDATION PERFORMANCE OF METAL-CHROMIUM-ALUMINUM (MCrAl), CERMET, AND MODIFIED ALUMINIDE COATINGS ON IN-100 AND TYPE VIA ALLOYS AT 1093 C
Daniel L. Deadmore Washington Feb. 1974 20 p refs
(NASA-TN-D-7530; E-7588) Avail: NTIS HC $2.75 CSCL 11F

Cermet, MCrAl, and modified aluminide types of coatings applied to IN-100 and NASA-TRW-VIA alloy specimens were cyclically oxidation tested in a high velocity (Mach 1) gas flame at 1093 C. Several coating compositions of each type were evaluated for oxidation resistance. The modified aluminide coating, Pt-Al, applied to alloy 6A proved to be the best, providing oxidation protection to approximately 750 hours based on weight change measurements. The second best, a CoCrAlY coating applied to 6A, provided protection to 450 hours. The third best was a cermet + aluminide coating on 6A with a protection time to 385 hours. Author

N74-16217*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TENSILE PROPERTIES FROM ROOM TEMPERATURE TO 1315 C OF TUNGSTEN-LINED TANTALUM-ALLOY (T-111) TUBING FABRICATED BY HOT ISOSTATIC PRESSING
Robert J. Buzzard and Robert R. Metroka Washington Feb. 1974 21 p refs
(NASA-TM-X-2964; E-7628) Avail: NTIS HC $2.75 CSCL 11F

The effects were studied of a thin tungsten liner on the tensile properties of T-111 tubing considered for fuel cladding in a space power nuclear reactor concept. The results indicate that the metallurgically bonded liner had no appreciable effects on the properties of the T-111 tubing. A hot isostatic pressing method used to apply the liners is described along with a means for overcoming the possible embrittling effects of hydrogen contamination. Author

N74-16218*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MASS TRANSFER IN A 1370 C (2500 F) LITHIUM THERMAL CONVECTION LOOP
Coulson M. Scheuermann Washington Feb. 1974 21 p refs
(NASA-TM-X-2986; E-7627) Avail: NTIS HC $2.75 CSCL 11F

Experimental results from a test to evaluate interstitial element mass transfer effects on T-111, ASTAR 811C, and ASTAR 1211C after 5000 hours in flowing lithium at 1370 C (2500 F) are presented. No gross corrosion effects were observed. However, hafnium and nitrogen transfer to cooler regions within the loop were noted. Oxygen was in general removed from test specimens, but there was no evidence to indicate that it was a major factor in the mass transfer process. Carbon and hydrogen transfer were not detected. Author

N74-16219*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STRAIN-CYCLING FATIGUE BEHAVIOR OF TEN STRUCTURAL METALS TESTED IN LIQUID HELIUM (4 K), IN LIQUID NITROGEN (78 K), AND IN AMBIENT AIR (300 K)
Alfred J. Nachtigall Washington Feb. 1974 33 p refs
(NASA-TN-D-7532; E-7613) Avail: NTIS HC $3.00 CSCL 11F

Strain-cycling fatigue behavior of 10 different structural alloys and metals was investigated in liquid helium (4 K), in liquid nitrogen (78 K), and in ambient air (300 K). At high cyclic lives, fatigue resistance increased with decreasing temperature for all the materials investigated. At low cyclic lives, fatigue resistance generally decreased with decreasing temperature for the materials investigated Only for Inconel 718 did fatigue resistance increase with decreasing temperature over the entire life range investigated. Comparison of the experimental fatigue behavior with that predicted by the Manson method of universal slopes showed that the fatigue behavior of these materials can be predicted for cryogenic temperatures by using material tensile properties obtained at those same temperatures. Author

N74-16220*# Kanner (Leo) Associates, Redwood City, Calif.
INVESTIGATION OF THE DISSOLUTION PROCESS OF OXIDE FILMS IN TITANIUM
V. V. Peshkov and E. S. Vorontsov Washington NASA Feb. 1974 10 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Metal. (USSR), no. 4, Jul. - Aug. 1973 p 99-102
(Contract NASw-2481)
(NASA-TT-F-15366) Avail: NTIS HC $3.00 CSCL 11F

The kinetics of oxide films in titanium is studied experimentally, using tempering colors as an indicator of the film thickness during the dissolution process. It is found that dissolution proceeds faster in vacuum than under normal conditions. Tests with welded joints showed that the presence of oxide films of a thickness ranging between 25 and 540 A at the butt surfaces does not impair the welding process, and that the weld attains the tensile strength of the matrix metal after one hour at a process temperature of 900 C. Author

N74-16221# Naval Research Lab., Washington, D.C.
RADIATION-EMBRITTLEMENT RESISTANCE OF ADVANCED NiCrMo STEEL PLATES, FORGINGS, AND WELDMENTS Final Report
J. R. Hawthorne 13 Sep. 1973 30 p refs
(Contract AT(49-5)-2110; RR0221141)
(AD-769215) Avail: NTIS CSCL 11/6

The promise of selected NiCrMo steels for advanced reactor vessel applications was demonstrated. Generally superior radiation embrittlement resistance, as well as superior preirradiation transition temperatures (Charpy-V 30-ft-lb index), were observed relative to the performance of A533 plates and welds of current usage. With only two exceptions, the A543 plates and A508 forgings examined showed sufficient resistance to a fluence of 4 x 10 to the 19th power n/sq cm = 1 MeV to retain a subzero transition temperature. Weld deposits typically had higher postirradiation temperatures than parent plates. GRA

N74-16222# Defence Research Information Centre, Orpington (England).
MAGNETOMECHANICAL PROPERTIES OF Mu-METAL
S. Drosdziok Aug. 1973 17 p refs Transl. into ENGLISH from Z. Naturforsch. (Tuebingen, v. 28A, no. 4, 1973 p 487-491
(DRIC-Trans-3297; BR30620) Avail: NTIS HC $3.00

A technique for measuring the magnetomechanical properties of high permeability materials is reported. The Joule magnetostriction of Mu-metal is obtained by shear strain measurement. Changes of shear modulus and magnetomechanical damping in dc and ac magnetic fields are investigated and discussed.
Author (ESRO)

N74-16223# Bureau of Mines, Albany, Oreg. Metallurgy Research Center.
EFFECT OF COPPER AND SILICON ON SELECTED MECHANICAL PROPERTIES OF HOT-ROLLED MEDIUM CARBON STEELS Report of Investigations, 1971 - 1973
Mark I. Copeland Aug. 1973 24 p refs
(PB-224090/1GA; BM-RI-7777) Avail: NTIS HC $2.75 CSCL

11F

The effect of copper and silicon contents of up to 1 wt % on the heat treatment response, hardness, tensile, and impact properties of hot-rolled medium-carbon steels was investigated. The steels were prepared by induction melting and fabricated into plates by forging and rolling. The tensile strength of 0.2 wt % carbon steels containing 0.3 wt % silicon was affected significantly by copper in both the hot rolled and heat treated (600C) conditions, but not the 0.3 wt % carbon steels. The 600C treatment was considered optimum as a post-rolling treatment to strengthen the steels by copper-precipitation. Strengthening of 0.2 wt % carbon steels by silicon was reduced by increasing copper contents. Author (GRA)

N74-16224# Bureau of Mines, College Park, Md. Metallurgy Research Center.

DETERMINATION OF EIGHT MINOR ELEMENTS IN LOW-ALLOY STEELS BY FLUORESCENT X-RAY SPECTROGRAPHY

William J. Campbell and David L. Neylan Aug. 1973 18 p refs

(PB-224062/OGA; BM-RI-7773) Avail: NTIS HC $2.75 CSCL 11F

Fluorescent X-ray spectrography was the principal method investigated. All X-ray data were processed by a time sharing computer. No corrections were found necessary for interelement effects or overlapping spectral lines. These studies show that X-ray spectrographic analysis of lathe-finished surfaces provide accurate determinations of aluminum, copper, chromium, manganese, nickel, phosphorus, silicon, and tin. Author (GRA)

N74-16225# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

STATUS AND PROSPECTS OF USING TITANIUM AND ITS ALLOYS IN THE NATIONAL ECONOMY

I. I. Kornilov 9 Oct. 1973 23 p refs Transl. into ENGLISH from Novyi Konstruktsionny Material Titan (USSR), 1972 p 5-15

(FTD Proj. 60107)

(AD-768807; FTD-HT-23-118-74) Avail: NTIS CSCL 11/6

The technological and economical effectiveness of using Ti and Ti alloys in a number of industrial areas and equipment is discussed. Data are included on service life and performance of equipment made from Ti and its alloys. Special attention was given to Ti mechanical properties, weldability, corrosion resistance, and insensitivity to corrosion under stress and various stress concentrations. E.H.W.

N74-16226# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

CRITICAL VIEW OF RESEARCH ON THE STRUCTURAL DIAGRAMS OF THE TITANIUM-OXYGEN SYSTEM ON CONNECTION WITH THE FORMATION OF SUBOXIDES

I. I. Kornilov 9 Oct. 1973 17 p refs Transl. into ENGLISH from the mono. "Novyy Konstruktsionny Material - Titan' USSR, 1972 p 24-30

(FTD Proj. 60107; FTD Proj. T74-01-10)

(AD-768465; FTD-HT-23-121-74) Avail: NTIS CSCL 11/6

A review is given of research on the structural diagrams of the titanium-oxygen system of suboxides. All but one of the reported works yield consistent results on the existence of the Ti-O system of suboxides which corresponds to the stoichiometric composition Ti6O, Ti3O, and Ti2O. K.M.M.

N74-16227# British Steel Corp., London (England).

GALVANIC CORROSION OF MILD STEEL WHEN COUPLED TO OTHER MATERIALS

K. E. Johnson and J. S. Abbott Aug. 1973 13 p refs

(PB-223741/OGA; BISRA-CEL/CH/23/73) Avail: NTIS HC $2.75 CSCL 11F

Corrosion rates of mild steel when coupled to each of 31 other metals and alloys were determined. Environments studied include industrial, rural and marine atmospheres, natural water, and sea water. Rank orders of corrosion rates for each environment were made. GRA

N74-16228# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

PHASE AND STRUCTURAL CHANGES IN TITANIUM UNDER PULSE LOADINGS

I. O. Pashkov, B. E. Gokhstein, and I. I. Polyskova 11 Oct. 1973 11 p refs Transl. into ENGLISH from the publ. "Novyy Konstruktsionny Material - Titan" USSR, 1972 p 70-73

(AD-768428; FTD-HT-23-129-74) Avail: NTIS CSCL 11/6

The presence of phase transition under an applied dynamic pressure similar to the (alpha to omega) phase transition realized with a static load was established. A methodology was worked out for fixing the high-temperature phase in pure titanium using pre-freezing in liquid nitrogen and an applied dynamic pressure produced by intense shock waves. A probable mechanism for observing the formation and fixing of the (beta)-phase in titanium was proposed. The described methodology for fixation can be used when studying the high-temperature phases of other pure metals. GRA

N74-16229# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

FEATURES OF THE EFFECT OF ALUMINUM ON MECHANICAL PROPERTIES OF TITANIUM

L. S. Moroz, I. N. Razuvaeva, and S. S. Ushkov 28 Sep. 1973 16 p refs Transl. into ENGLISH from the publ. "Novyy Konstruktsionny Material - Titan" USSR, 1972 p 109-114

(AD-768430; FTD-HT-23-138-74) Avail: NTIS CSCL 11/6

The significant change in mechanical properties of the titanium and alpha-alloys upon the introduction of aluminum evidently occurs not only because of the elastic distortions introduced by the aluminum atoms in the titanium lattice, but also because of the appearance of a second phase. The heterogeneity of the aluminum distribution turns out to be very stable and is not removed during prolonged homogenizing annealing. GRA

N74-16230# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

OXIDIZABILITY OF IVT1 TITANIUM BETA-ALLOY AND ITS PROTECTION FROM GAS CORROSION

N. M. Fedorchuk, D. V. Ignatov, and L. A. Petrova 9 Oct. 1973 12 p refs Transl. into ENGLISH from the publ. "Novyy Konstruktsionny Material - Titan" USSR, 1972 p 131-134

(AD-768431; FTD-HT-23-143-74) Avail: NTIS CSCL 11/6

The article discusses kinetics of oxidizing the beta-alloy of ITV1 titanium, containing 7% Mo, 5.5% Cr, 3% Fe, and 3% Al. The ITV1 alloy belongs to the metastable beta-alloys of titanium, which combine high technological plasticity in the quenched state with high strength and satisfactory plasticity after aging. Low-temperature beta to (alpha - beta) transformation occurring in the alloy does not effect the oxidation kinetics of IVT1 alloy. The change in the rate constants of the parabolic oxidation law at 740C can be explained by the (alpha - beta) to beta phase transformation. Surface alloying with aluminum effectively decreases the oxidation rate of the alloy at high temperatures; for example, at 1000C the oxidation rate of the samples coated with aluminum is cut by a factor of 12. GRA

N74-16231# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

OXIDIZABILITY OF AN-TYPE BETA-ALLOYS OF TITANIUM AND PROTECTING THEM AGAINST GAS CORROSION

N. M. Fedorchuk, D. V. Igatov, and V. B. Gromova 9 Oct. 1973 10 p refs Transl. into ENGLISH from the publ. "Novyy Konstruktsionny Material - Titan" USSR, 1972 p 135-138

(AD-768432; FTD-HT-23-144-74) Avail: NTIS CSCL 11/6

The oxidation kinetics and phase composition of the scale of AN5, AN6, and AN6a titanium-niobium based test alloys is studied. Alloy AN5 is a composite of elements belonging to the Ti - Nb - Cr - Mo system. In the original state it has a beta-solid solution structure, which breaks down at 850C with the formation of the compound (TiNb)Cr2. The AN6 and AN6a alloys are distinguished from AN5 by aluminum and boron additions and the fact that they do not contain molybdenum. GRA

N74-16232# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

INVESTIGATION OF DURALUMIN DURABILITY DURING REPEATED AXIAL TENSION WITH IMPACT AND IMPACTLESS LOADS

V. Ya. Slobodyanyuk 9 Oct. 1973 9 p Transl. into ENGLISH

from Samoletostr. Tekh. Vozdush. Flota (USSR), no. 25, 1971 p 94-97
(AD-768438; FTD-HT-23-186-74) Avail: NTIS CSCL 11/6

The impact character was studied of repeated loads to which aircraft systems are subjected during operation, such as landing gear, piston engine and hydraulic system parts. Fatigue tests were conducted on cylindrical samples of typical aircraft alloy. It was found that the endurance and durability characteristics of duralumin under impact loads are less than during impactless conditions with axial tension. F.O.S.

N74-16233# Army Foreign Science and Technology Center, Charlottesville, Va.
PREPARATION OF BIMETALLIC BILLETS BY ELECTRO-SLAG MELTING
N. Ya. Shcherbina and I. I. Sushchukslyusarenko 7 Mar. 1973 5 p refs Transl. into ENGLISH from Tekhnol. Organ. Proizvod. (USSR), no. 4, 1970 p 63-64
(AD-759810; FSTC-HT-23-1219-72) Avail: NTIS CSCL 11/6

Taking advantage of the fact that in the production of bimetallic material through using the electroslag process, the melting temperature of the electrode material is lower than the melting point temperature of the base material, it was proposed that the slag bath temperature be lowered to a point where the base metal does not melt. High quality function of materials is achieved in this case through wetting the hard base metal with melted electrode metal in the process of welding. The slag bath temperature was lowered successfully through the creation of special chemically active fluxes with the introduction of a temperature stabilizing component into their composition.
Author (GRA)

N74-16234# Army Foreign Science and Technology Center, Charlottesville, Va.
ABRASIVE BREAKDOWN OF SOLIDS
V. N. Kashcheev 25 Jun. 1973 294 p refs Transl. into ENGLISH of the publ. "Abrazivnoe Razrushenie Tverdykh Tel" Moscow, Nauka, 1970 p 247
(AD-764369; FSTC-HT-23-2348-72) Avail: NTIS CSCL 11/6

The monograph discusses the laws which govern the interaction of a hard mineral grain on the surface of metals and alloys from the standpoint of various types of alloy strengthening and from the standpoint of the conditions and type of work. A physical interpretation of the abrasive wear process is given, and the characteristics of the material which have an effect on wear resistance are determined. The relativity of the concepts abrasive grain capacity, and wear resistance of alloys, is proved. The data obtained from an analysis of the abrasive process which is important for understanding the action of rigidly fixed abrasive grain are given. Practical results are obtained about ways in which the resistance to wear of the material can be improved through additions and through action on structure of the worn material. Author (GRA)

N74-16235# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SUPER-LIGHT CONSTRUCTION ALLOYS (CHAPTERS 1, 3, 9)
M. E. Drits, A. F. Sviderskaya, F. M. Elkin, and V. F. Trokhova 8 Nov. 1973 53 p refs Transl. into ENGLISH from the publ. "Sverkhlegkie Konstruktsionnye Splavy" USSR, 1972 30 p
(AD-769561; FTD-MT-24-830-73) Avail: NTIS CSCL 11/6

Contents: Physicochemical and mechanical properties of magnesium and lithium; Effect of lithium on magnesium properties; Application of magnesium-lithium alloys. GRA

N74-16236# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
CORROSION STUDIES OF Fe-Ni AND BETA-3 TITANIUM ALLOYS Final Report, 1 Jun. 1968 - 19 Jun. 1972
Dale O. Condit Oct. 1973 12 p refs
(AF Proj. 7021)
(AD-769480; ARL-73-0136) Avail: NTIS CSCL 11/6

This investigation was conducted to elucidate factors involved in the stress corrosion cracking of alloys of interest to the aerospace industry. The study was concentrated in two particular areas: (1) Potentiodynamic and potentiostatic polarization studies of high purity Fe-Ni alloys in chloride-containing and non-chloride-containing H_2SO_4; and (2) Time-to-cracking for notched and unnotched Beta III titanium alloys which had been given a variety of thermomechanical treatments. GRA

N74-16237# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
SOLID SOLUTION SOFTENING RHENIUM DUCTILIZING EFFECT AND BUBBLE STRENGTHENING IN TUNGSTEN-RHENIUM ALLOYS Technical Report, 15 Oct. 1969 - 15 Oct. 1972
Ronald P. Simpson Sep. 1973 164 p refs
(AF Proj. 7351)
(AD-769343; AFML-TR-73-235) Avail: NTIS CSCL 11/6

The effect of carbon additions to tungsten and tungsten-rhenium alloys was determined by anelastic relaxation, stress relaxation and mechanical property studies. Rhenium alone, rather than a combination of rhenium and interstitials, lowers the lattice friction stress (Peierls stress) and is responsible for the ductilizing effect in tungsten. Bubbles were identified at grain boundaries of recrystallized, doped tungsten and tungsten-rhenium alloys from scanning electron microscopy studies of intergranular fracture surfaces. Auger electron spectroscopy demonstrated that these bubbles are coated with potassium which is highly localized at grain boundaries. Varying concentrations of rhenium had no noticeable effect on fracture behavior, bubble size or distribution, or potassium segregation. The bubbles dramatically raise recrystallization temperature and control grain growth texture and are, therefore, responsible for the high temperature creep properties of doped tungsten and tungsten-rhenium alloys. (Modified author abstract) GRA

N74-16238# Army Weapons Command, Rock Island, Ill. General Thomas J. Rodman Lab.
EVALUATION OF TORSIONAL PROPERTIES OF SPRING MATERIALS
Henry P. Swieskowski May 1973 48 p refs
(DA Proj. 1W5-62604-A-607)
(AD-768768; AMSWE-R-RR-T-3-32-73) Avail: NTIS CSCL 13/9

Torsional properties of various spring materials were evaluated. All materials tested were of solid circular cross section with a diameter of approximately .200 inch. Test specimens were twisted on a torsion tester equipped with an automatic recorder by which torque-angular strain diagrams were plotted. Diagrams were analyzed and measurements made to determine values for proportional and elastic limits. The amount of increase to the proportional and elastic limits that results from strain hardening was determined. The effects of shot peening on the elastic limit were also studied. Strain hardening of the high carbon steels had little effect on the proportional limit, but did produce a substantial increase in the elastic limit. The shot peening operation had little noticeable effect on the torsional properties. Detailed tables of torsional properties are presented and results discussed. Author (GRA)

N74-16239# Battelle Columbus Labs., Ohio.
EFFECT OF TEMPERATURE AND STRAIN UPON SHIP STEELS Final Technical Report
R. L. Rothman and R. E. Monroe Mar. 1973 42 p refs
(Contract N00014-71-C-5088; Proj. SR-199)
(AD-768891; SSC-235) Avail: NTIS CSCL 11/6

The effects of flame straightening and both hot and cold forming upon materials properties of hot-rolled, normalized, and quenched and tempered steels were investigated. Flame straightening was studied by first simulating the effects of time at temperature upon the tensile and impact properties of seven steels. Straightening was then performed within the determined limits upon four-foot-square plates which had been distorted by welding them into a rigid frame. As a result of these studies, it is recommended that flame straightening with appropriate controls be allowed as an acceptable process for distortion removal for both normalized and quenched and tempered steels. Simulations of outer fiber strain resulting from both hot and cold forming were conducted to determine the effects of temperature and strain upon properties. In general, it was found that either tensile or impact properties were reduced to some degree by most operations. Author (GRA)

N74-16240# Naval Ship Research and Development Center, Annapolis, Md.
FATIGUE CRACK PROPAGATION IN A 5456-H117 ALUMINUM ALLOY IN AIR AND SEA WATER
H. P. Chu Oct. 1973 29 p refs
(SF54541011)
(AD-769467; NSRDC-4169) Avail: NTIS CSCL 11/6

Fatigue data on a 5456-H117 aluminum alloy have been obtained in air and sea water by fracture mechanics methods. It is found that the presence of sea water increases the crack growth rates and lowers the threshold stress intensity. The data for five stress ratios are correlated with two empirical equations. The effect of sea water on fatigue cracking is also examined by electron fractographs. Author (GRA)

N74-16241# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE POSSIBILITY OF USING TITANIUM ALLOYS IN EQUIPPING A CHEMICAL COMBINE
F. N. Tavadze, T. M. Dvali, S. N. Mandzhgaladze, E. M. Strikha, and N. D. Darchiya 5 Nov. 1973 33 p refs Transl. into ENGLISH from the monograph "Novyy Konstruktsionny Material - Titan" 1972 p 206-220
(AD-769564; FTD-HT-23-162-74) Avail: NTIS CSCL 11/6

The corrosion behavior of certain titanium alloys in industrial sulfate solutions and sulfate-containing media was examined in order to study the possibility of using titanium in equipment for a caprolactam plant in a chemical combine. The corrosion resistance of the titanium alloys was determined by the gravimetric method. Tests were conducted in simulated conditions, and also directly under conditions of operation of the following equipment. GRA

N74-16242# Army Materials and Mechanics Research Center, Watertown, Mass.
AN INVESTIGATION OF THE EQUILIBRIUM ALPHA AND BETA PHASES IN THE ALLOY Ti-6Al-4V Final Report
Paul J. Fopiano and Matthias F. Comerford Oct. 1973 14 p refs
(DA Proj. 1T0-62105-A-328)
(AD-769734; AMMRC-TR-73-44) Avail: NTIS CSCL 11/6

Specimens of Ti-6Al-4V alloy were heat treated to produce several equilibrium compositions of the alpha and beta phases whose minimum dimensions were 10 microns. The phases were analyzed with an electron microprobe analyzer and their compositions were evaluated based on a microprobe analysis of standard compositions made up of the major alloying elements. The vanadium partitioned preferentially to the beta phase while the aluminum partitioned preferentially to the alpha phase, but not to the extent expected. The results are correlated with the published literature. Selected compositions of the alpha and beta phases were synthesized. The results of aging studies on the single phases are compared to the composite alloy.
Author (GRA)

N74-16243# Brown Univ., Providence, R.I. Dept. of Engineering.
PLASTIC DEFORMATION OF METALS AT HIGH STRAIN RATES. PART 2: STEADY-STATE CRACK PROPAGATION IN A PLATE SUBJECTED TO COMBINED BENDING AND TENSION Summary Report, Jul. 1972 - Feb. 1973
A. F. Fossum and L. B. Freund Jul. 1973 31 p refs
(Contract F33615-71-C-1308; AF Proj. 7353)
(AD-769446; AFML-TR-73-105-Pt-2) Avail: NTIS CSCL 11/6

The dynamic stress intensity factor and energy release rate are determined for the configuration in which a semi-infinite, constant velocity crack is propagating in a finite plate subjected to pure bending about the direction of propagation. In addition, a constant extension at the edges of the plate is imposed in the direction normal to the direction of crack propagation. In one case, zero shear stress is imposed at the edges of the plate and, in another case, zero displacement is imposed at the edges of the plate in the direction of crack propagation. For the case of pure bending alone, the dynamic stress intensity factor is shown to be independent of crack velocity. The problems are formulated in terms of the Poisson-Kirchhoff theory of thin plates in which the Kirchhoff conditions for a free edge are applied. The stress intensity factors are solved for directly by application of Laplace transform methods, the Wiener-Hopf technique, and asymptotic analysis. Author (GRA)

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N74-16244* Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
VERY FINE GRAIN ELECTROOPTICAL CERAMICS PREPARED BY HOT PRESSING Final Report [ETUDE DES CERAMIQUES ELECTROOPTIQUES PRESSEES A CHAUD A GRAINS TRES FINS]
A. Hermosin, M. Hildebrandt, and J. Nicolas Sep. 1972 36 p refs In FRENCH; ENGLISH summary
(Contract DGRST-71-7-2823)
(Rept-9-553) Avail: NTIS HC $4.00

Their electrooptic properties were studied. The chemical diagram investigated was the lead-lanthanum zirconate-titanate system (PLZT). Two aspects were considered: (1) improvement of powder preparation method and sintering conditions; and (2) optical and electrical measurements. Materials were obtained with an optical transmission of about 65%; their index of refraction was 2.5. The average grain size was about 1 micron. Optical scattering was under 30 min for 80% of light intensity. Birefringences from 0 to 0.005 were measured as a function of remanent polarization. Author (ESRO)

N74-16245*# Kentucky Univ., Lexington.
MECHANICAL BEHAVIOR OF POLYCRYSTALLINE CERAMICS: BRITTLE FRACTURE OF Si C - Si3N4 MATERIALS Annual Report
Martin H. Leipold, Cawas M. Kapadia, and Anant H. Kelkar 1 Sep. 1973 45 p refs
(Grant NGL-18-001-042)
(NASA-CR-136704; AR-4) Avail: NTIS HC $4.25 CSCL 11D

The results are described of the final stage of the research involving the role of anions in the behavior of magnesium oxide, as well as the continued efforts of the fracture behavior of silicon nitride materials. These efforts, particularly the first, are further sub-divided in subsections describing individual types of behavior of materials. Author

N74-16246*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
PARTICULATE AND SOLAR RADIATION STABLE COATING FOR SPACECRAFT Patent Application
Wayne S. Slemp, inventor (to NASA) Filed 27 Dec. 1973 10 p
(NASA-Case-LAR-10805-1; US-Patent-Appl-SN-428992) Avail: NTIS HC $3.00 CSCL 11D

A laminate thermal control coating for spacecraft is described. The coating is comprised of a layer of solar radiation stable film, a layer of particulate-radiation stable film applied to the upper surface of the solar-radiation stable film, and a layer of reflecting material applied to the lower surface of the solar radiation stable film. The coating experiences no increase in solar radiation absorptance upon exposure to particular or solar radiation as the particulate radiation is substantially absorbed in the particulate radiation stable layer and the solar radiation partially absorbed by the particulate radiation stable layer is transmitted by the solar-radiation stable film to the reflecting material which reflects it back through the laminate and into space. NASA

N74-16247# Technische Univ., Berlin (West Germany).
STUDIES ON THE CRYSTALLIZATION OF BOROSILICATE GLASSES FOR THE FIXATION OF HIGHLY RADIOACTIVE FISSION PRODUCT OXIDES Ph.D. Thesis [UNTERSUCHUNGEN UEBER DIE KRISTALLISATION VON BOROSILICATGLAESERN, DIE ZUR FIXIERUNG HOCHRADIOAKTIVER SPALTPRODUKTOXIDE BESTIMMT SIND]

Wilfried Heimerl 1972 112 p refs In GERMAN
Avail: NTIS HC $7.75

Crystallization behavior and properties of various borosilicate glasses -- formed from volcanic filtrolit with additions of Na2CO3, B2O3, and Al2O3 -- are studied to evaluate their suitability as radioactive waste solidifiers. Thermodynamic and microstructure analyses establish the alkaline oxide content as the most important criterium in the crystallization process; hydrolytic resistance is most pronounced in low alkaline oxide glasses. It is concluded that glasses with low alkaline oxide content are suitable for the incorporation of radioactive fission products.
Transl. by G.G.

N74-16248*# TRW Systems Group, Redondo Beach, Calif. Applied Chemistry Dept.
DEVELOPMENT OF AUTOCLAVABLE ADDITION TYPE POLYIMIDES Final Report, 1 May 1972 - 1 Sep. 1973
R. J. Jones, R. W. Vaughan, M. K. ORell, and C. H. Sheppard 14 Feb. 1974 147 p refs
(Contract NAS3-15834)
(NASA-CR-121251; TRW-21863-6013-RU-00) Avail: NTIS HC $9.50 CSCL 11D

Two highly promising approaches to yield autoclavable addition-type polyimides were identified and evaluated in the program. Conditions were established for autoclave preparation of Hercules HMS graphite fiber reinforced composites in the temperature range of 473 K to 505 K under an applied pressure of 0.7 MN/m2 (100 psi) for time durations up to four hours. Upon oven postcure in air at 589 K, composite samples demonstrated high mechanical property retention at 561 K after isothermal aging in air for 1000 hours. Promise was shown for shorter term mechanical property retention at 589 K upon exposure in air at this temperature.
Author

N74-16249*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TRANSPARENT FIRE RESISTANT POLYMERIC STRUCTURES Patent Application
George M. Fohlen, John A. Parker, and Paul M. Sawko, inventors (to NASA) Filed 29 Jan. 1974 28 p
(NASA-Case-ARC-10813-1; US-Patent-Appl-SN-437556) Avail: NTIS HC $3.50 CSCL 11D

Transparent impact-, heat- and fire-resistant polymeric materials for making windows, windshields and plane canopies were developed. The polymeric materials comprise an epoxy resin cured with an alkoxy boroxine catalyst and a polycarbonate resin, preferably a polyphenolphthalein carbonate resin. Laminates including the advantages of both resins comprise a transparent layer of epoxy resin and a transparent layer of a polycarbonate resin joined together with a transparent adhesive interlayer.
Author

N74-16250*# Aluminum Co. of America, New Kensington, Pa. Research Labs.
EFFECT OF POLYMER COATINGS ON FATIGUE STRENGTH OF ALUMINUM ALLOY 2024 BOX BEAMS Final Report, Apr. 1971 - May 1972
G. E. Nordmark and R. A. Kelsey May 1972 21 p refs
(Contract NAS2-6415)
(NASA-CR-114699) Avail: NTIS HC $3.25 CSCL 11C

Previous investigators have shown that polymer coatings raise the fatigue strength of metals tested in air to about the same level as that of uncoated specimens tested in vacuum. The results are given of tests to determine if a polymer coating would improve the fatigue strength of built-up aluminum alloy members simulating aircraft construction. Aluminum alloy 2024-T4 riveted box beams were subjected to constant amplitude fatigue tests in air as well as in salt water fog. The coating did not improve the fatigue strength of beams tested in either environment. This is believed to result from the fact that most failures originated at rivet holes, which were isolated from both the coating and the environment.
Author

N74-16251*# Chrysler Corp., New Orleans, La.
HEAT TRANSFER PHASE CHANGE PAINT TEST (OH-42) OF A ROCKWELL INTERNATIONAL SSV ORBITER IN THE NASA/LRC MACH 8 VARIABLE DENSITY WIND TUNNEL
R. Jones, T. Creel, P. Lawing, M. Quan, W. Dye, J. Cummings, H. Gorowitz, C. Craig, and G. Rich Dec. 1973 244 p refs
(Contract NAS9-13247)
(NASA-CR-134076; DMS-DR-2101) Avail: NTIS HC $14.25 CSCL 11C

Phase change paint tests of a Rockwell International .00593-scale space shuttle orbiter were conducted in the Langley Research Center's Variable Density Wind Tunnel. The test objectives were to determine the effects of various wing/underbody configurations on the aerodynamic heating rates and boundary layer transition during simulated entry conditions. Several models were constructed. Each varied from the other in either wing cuff radius, airfoil thickness, or wing-fuselage underbody blending. Two ventral fins were glued to the fuselage underside of one model to test the interference heating effects. Simulated Mach 8 entry data were obtained for each configuration at angles of attack ranging from 25 to 40 deg, and a Reynolds number variation of one million to eight million. Elevon, bodyflap, and rudder flare deflections were tested. Oil flow visualization and Schlieren photographs were obtained to aid in reducing the phase change paint data as well as to observe the flow patterns peculiar to each configuration.
Author

N74-16252*# United Aircraft Corp., East Hartford, Conn. Research Labs.
STUDY TO DETERMINE AND ANALYZE THE STRENGTH OF HIGH MODULUS GLASS IN EPOXY-MATRIX COMPOSITES Final Report
J. F. Bacon Jan. 1974 53 p refs
(Contract NAS1-11648)
(NASA-CR-132377; N911396-13) Avail: NTIS HC $4.75 CSCL 11D

Glass composition research was conducted to produce a high modulus, high strength beryllium-free glass fiber. This program was built on the previous research for developing high modulus, high strength glass fibers which had a 5 weight percent beryllia content. The fibers resulting from the composition program were then used to produce fiber reinforced-epoxy resin composites which were compared with composites reinforced by commercial high modulus glass fibers, Thornel S graphite fiber, and hybrids where the external quarters were reinforced with Thornel S graphite fiber and the interior half with glass fiber as well as the reverse hybrid. The composites were given tensile strength, compressive strength, short-beam shear strength, creep and fatigue tests. Comments are included on the significance of the test data.
Author

N74-16253# Defence Research Information Centre, Orpington (England).
THE INFLUENCE OF TEXTILE STRUCTURE ON ITS PERMEABILITY TO HEAT AND MOISTURE
J. Mecheels et al Jul. 1973 29 p refs Transl. into ENGLISH from Melliand Textilber. (Heidelberg), v. 12, 1972, p 1403-1411
(DRIC-Trans-3184; BR30527) Avail: NTIS HC $3.50

An attempt is made to establish the influence of a raw textile material, structure, and construction on environmental interaction with a body. Different fabrics with varying thickness and thread tension were tested for heat and moisture permeability. The measuring techniques and results are reported.
ESRO

N74-16254# Army Materials and Mechanics Research Center, Watertown, Mass.
INFLUENCE OF SOME SPECIFIC ADDITIVES ON THE STRENGTH OF PRESSURE SINTERED BERYLLIA
Jacob Greenspan May 1973 13 p
(DA Proj. 1T0-62105-A-330)
(AD-768789; AMMRC-TR-73-25) Avail: NTIS CSCL 11/2

An exploratory survey was conducted on the influence of some specific additives of MgO, Al2O3, and SiC, to BeO with respect to pressure sintering processing, and with respect to strength development. Highest strengths were represented by BeO-Al2O3 binaries of very fine grain size and dense microstructures.
Author (GRA)

N74-16255# Tel-Aviv Univ. (Israel). School of Engineering.
SOME EFFECTS OF FIBER WABBLINESS IN COMPOSITE PLATES Final Report
Y. Benveniste and Y. Weitsman Apr. 1973 46 p refs

(Contract DAJA37-73-C-0400; DA Proj. 200-61102-B-13B) (AD-768408; ARDG(E)-E-1450) Avail: NTIS CSCL 11/4

The paper concerns the effects that slight deviations in fiber directions have on the stress field in composite plates. The fiber reinforced plates are represented by the equivalent modulus theory as homogeneous transversely isotropic regions and the deviations in fiber directions are incorporated by varying the directions of the axes of the material symmetry. Solutions are presented to three specific boundary value problems. In two of those problems, comparison is provided with results derived under the assumption of fiber inextensibility. It is shown that, for the problems considered, the model of inextensible fibers yields very satisfactory answers. Furthermore, it is found that when the misalignments in fiber directions are localized within a small region of the plate, they give rise to secondary stresses whose amplitude is much higher than the magnitudes of the secondary stresses associated with widely spread misalignments.

Author (GRA)

N74-16256# National Swedish Inst. for Building Research, Stockholm.

TEST METHODS FOR THE MECHANICAL PROPERTIES OF PAINTS AND VARNISHES

Vivi-Ann Harnmarback, Erik Strom, and Ulf Ulfvarson 1973 100 p refs

(PB-224211/3GA; D2-1973) Avail: NTIS HC $3.75; Svensk Byggtjanst, box 1403, S-11184 Stockholm: Sw. Kr. 20 CSCL 11C

A total of 16 methods were used to test for mechanical properties (hardness, extensibility, ductility, scratch resistance, adhesion, impact resistance, resistance to dry abrasion) in 26 different paints and varnishes. Their dispersions and selectivities, the influence of temperature and the relations between the results of tests for the same or different properties, and values to be expected in testing commercial paints and varnishes were ascertained. The methods for hardness and extensibility are generally acceptable while the other methods must be challenged for different reasons. Temperature exerts a fairly considerable influence on the results of determinations. A smaller test was also performed in order to determine the properties of free films in a tensile testing machine. GRA

N74-16257# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.

DEVELOPMENT OF A DIESEL ENGINE TEST TECHNIQUE FOR EVALUATING ARCTIC ENGINE OILS Final Report, Feb. 1970 - Jul. 1972

Sidney J. Lestz Sep. 1973 82 p refs

(Contract DAAD05-70-C-0250)

(AD-768901; AFLRL-24) Avail: NTIS CSCL 11/8

An engine test technique was developed for evaluating the performance of sub -zero engine oils in high-output diesel engines. Field tested lubricants were used to develop the laboratory engine performance criteria. Validity of the test procedure is demonstrated by direct laboratory to field correlation. The major areas of test technique development, establishment of performance criteria, lubricant evaluations, and overall lubricant performance are presented and discussed as an integrated effort rather than each as a separate project phase. Illustrations of hardware, including test set-up and test components are included for summary purposes only. Physical and compositional properties of the test development lubricant are discussed which help explain why the engine discriminates lubricant quality under high-output conditions. The test method developed as a result of this work could be used to qualify military arctic engine oil candidates.

Author (GRA)

N74-16258# Massachusetts Univ., Amherst. School of Engineering.

THE EFFECTS OF MICROSTRUCTURE ON THE FRACTURE ENERGY OF HOT PRESSED MgO

J. B. Kessler, J. E. Ritter, Jr., and R. W. Rice (NRL, Washington, D. C.) Jul. 1973 29 p refs

(Contract N00014-68-A-0146; NR Proj. 200-016)

(AD-768840; UM-73-8) Avail: NTIS CSCL 11/2

The work-of-fracture technique was used to investigate the effects of various microstructural parameters on the fracture energy of relatively dense, hot pressed MgO. Grain size, amount and location of porosity, and grain boundary precipitates were the parameters of major interest. The fracture energy measurements were found to be dependent on the microstructure and ranged from 0.47 to 2.7 x 10 to the 4th power ergs/sq cm. Grain boundary precipitates, found in the as hot-pressed samples with LiF additives, weakened intergranular bonding and caused the lowest fracture energies. Limited porosity (up to 1.0%) had only a small effect on the fracture energy when found at the grain boundaries, although this porosity did facilitate intergranular fracture. Porosity found within the grains appeared to promote a tearing between cleavage planes which in turn increased the fracture energy. The effect of grain size on fracture energy was not conclusive, although the percentage of transgranular fracture increased with grain size. These fracture energy values are compared to strength measurements and the limitations of the Griffith equation in explaining the results are discussed.

Author (GRA)

N74-16259# Army Materials and Mechanics Research Center, Watertown, Mass.

EFFECT OF ADHESIVE ON THE IMPACT RESISTANCE OF LAMINATED PLASTICS FOR WINDSHIELD APPLICATIONS

Joyce L. Illinger and Robert W. Lewis Aug. 1973 20 p ref (DA Proj. 1T0-62105-A-329)

(AD-769735; AMMRC-TR-73-36) Avail: NTIS CSCL 11/9

Clamped acrylic-polycarbonate laminates show improved resistance to penetration over that shown by either material alone. Use of thermal bonding techniques or brittle adhesives to form a laminate result in a significant decrease in the ballistic resistance. The brittle adhesive induces spallation of the polycarbonate causing a significantly lower impact resistance and changes the mode of failure from ductile to brittle. Flexible transparent polyurethane adhesives were synthesized with systematic variation in proportions of monomer and structure of the soft segments. Ballistic resistance of laminates using these adhesives was improved by forty percent. The change in relative amount of the hard segment had no significant effect upon the impact behavior. Strength of adhesive bonding was varied by a factor of two through changes in laminating temperature. No correlation between bond strength and ballistic performance was found. Thus, laminates using transparent flexible adhesives with sufficient bond strength to prevent delamination upon impact show ballastic resistance up to fifty percent better than the best commercially available transparent impact resistant polymeric material. Author (GRA)

N74-16260# Gulf General Atomic, San Diego, Calif.

THERMAL EXPANSIVITY AND CONDUCTIVITY OF PURE AND SILICON ALLOYED PYROCARBONS

R. J. Price and K. Koyama 15 Oct. 1973 19 p refs

(Contract DAHC15-71-C-0282)

(AD-769108; Gulf-GA-A12772) Avail: NTIS CSCL 11/2

Measurements were made of the thermal expansivity (22 to 1000 C) and the thermal conductivity (22 to 800 C) of isotropic pyrocarbons deposited in fluidized beds and containing up to 34 wt % silicon in the form of beta-silicon carbide particles. The thermal expansivity of the pure carbons was proportional to their density, while that of the silicon-alloyed carbons decreased with increasing silicon content. The thermal conductivity of both pure and silicon-alloyed pyrocarbons increased with increasing temperature. The room-temperature thermal conductivity of the pure carbons increased with increasing apparent crystallite height (Lc), and the conductivity of the silicon-alloyed carbons was significantly lower than that of pure pyrocarbon with the same Lc. The results suggest that silicon entering substitutionally into the carbon lattice may reduce the conductivity. (Modified author abstract) GRA

N74-16261# Army Foreign Science and Technology Center, Charlottesville, Va.

SYNTHETIC ADHESIVES

D. A. Kardashov 1 Nov. 1973 630 p refs Transl. into ENGLISH from Sinteticheskie Klei (Moscow), 1968

(AD-769295; FSTC-HT-23-1168-73) Avail: NTIS CSCL 11/1

Synthetic adhesives are successfully used for bonding of various materials in the motor vehicle, aviation, shipbuilding, electrical and electronic, chemical, woodworking and shoe

industries and in many other branches of the economy. Chapter I briefly describes the basic concepts concerning the mechanism of bonding action. Chapters 2 and 3 describe the most important adhesives based on synthetic high-molecular compounds; the methods of production and properties of adhesives; and the basic available information on monomer and polymer compounds, which make up the basis of various adhesives. The methods of manufacture and recommended modes of bonding some adhesive compounds are discussed. The processes of production of film adhesives are also described. Chapter 4, dedicated to the technology of bonding and the use of adhesives, presents examples of the use of adhesives for joining of metals and nonmetallic materials in various areas of modern technology. GRA

N74-16262# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
APPLICATIONS OF PLASTICS FOR MARINE OUTFITTING AND MARINE INSTALLATIONS
M. Popovic 11 May 1973 30 p refs Transl. into ENGLISH from Brodogradnja (Yugoslavia), v. 22, no. 4, 1971 p 182-191 (AF Proj. 7343)
(AD-761539; FTD-HC-23-563-72) Avail: NTIS CSCL 13/10

An analysis is given of the application possibilities of plastics to the outfitting of ships and installations in ships. The properties of these materials are given, and their applications to plastic gears, bearings, propellers, tubes, damping systems, decorative laminations, and plastic covers of ship floors as well as anti-corrosive coatings. Author (GRA)

N74-16263# Michigan Univ., Ann Arbor. Dept. of Engineering Mechanics.
ANALYSIS OF RAIN EROSION OF COATED MATERIALS Technical Report, Jun. 1972 - Jun. 1973
George S. Springer, Chen-I. Yang, and Poul S. Larsen Sep. 1973 72 p refs
(Contract F33615-72-C-1563; AF Proj. 7340)
(AD-769448; AFML-TR-73-227) Avail: NTIS CSCL 11/3

The behavior of coat-substrate systems subjected to repeated impingements of liquid droplets was investigated. The system studied consisted of a thick homogeneous substrate covered by a single layer of homogeneous coating of arbitrary thickness. Based on the uniaxial stress wave model, the variations of the stresses with time were determined both in the coating and in the substrate. Employing the fatigue theorems established for the rain erosion of homogeneous materials, algebraic equations were derived which describe the incubation period, and the mass loss of the coating past the incubation period, in terms of the properties of the droplet, the coating and the substrate. The results were compared to available experimental data and good agreement was found between the present analytical results and the data. The differences between the uniaxial stress wave and the uniaxial strain wave models were also evaluated by calculating according to both models (a) the stress at the coat-liquid interface, (b) the stress that would occur in the substrate in the absence of the coating, and (c) the stress in the coating after the first wave reflection from the substrate. Author (GRA)

N74-16264# Honeywell, Inc., Minneapolis, Minn. Systems and Research Center.
APPLICATION AND DURABILITY OF SOLAR ABSORBER COATINGS Final Report
R. E. Peterson and J. W. Ramsey Jul. 1973 50 p refs
(Contract F33615-73-C-5074; AF Proj. 7360)
(AD-769449; Rept-2817-3001; AFML-TR-73-167) Avail: NTIS CSCL 11/3

The suitability of solar absorber coatings for use as the thermal power source to drive spaceborne Vuilleumier cycle cryogenic refrigerators was evaluated. The coating tested consisted of layers of A1203-Mo-A1203 (AMA) on various substrates. The coating was thermally cycled from 1500 to 1600F about 10,000 times, simulating conditions for three years in orbit. Results are discussed. GRA

N74-16265# Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Engineering.
HEAT GENERATION IN COMPOSITE MATERIALS DURING FATIGUE LOADING Interim Report
Kenneth L. Reifsnider, Wayne W. Stinchcomb, Richard S. Williams, and Larry A. Marcus May 1973 37 p refs
(Grant AF-AFOSR-2358-21; AF Proj. 9781)
(AD-769351; VPI-E-73-21; AFOSR-73-1961TR) Avail: NTIS CSCL 11/4

Two composite materials, boron-epoxy (B/E sub p) and boron-aluminum (B/Al) were monitored during cyclic loading to establish the amount of heat generated by dissipative internal deformation processes. Both the magnitudes and distributions of heat generation were recorded in real time so that heat build up could be correlated with load amplitude, frequency of load oscillation, and damage development. The study of heat generation was carried out with three measurement techniques, liquid crystals, thermocouples, and video-thermography. Temperature increases of 20F in B/Al and 70F in B/(E sub p) near stress concentration positions were found to be common. Correlations of heat generation with mechanical hysteresis, frequency of load oscillation and development of damage are established. (Modified author abstract) GRA

N74-16266# Army Natick Labs., Mass. Clothing and Personal Life Support Equipment Lab.
SCANNING ELECTRON MICROSCOPY AS RELATED TO THE STUDY OF HIGH-SPEED FIBER IMPACT Final Technical Report
Roy C. Laible, Frank Figucia, and Barbara Kirkwood Oct. 1973 24 p refs
(DA Proj. 1T0-62105-A-329)
(AD-768766; C/PLSEL-114; USA-NLABS-TR-73-58-CE) Avail: NTIS CSCL 11/5

Aliphatic polyamide fibers of the nylon 6 and nylon 6,6 type have been important materials for many industrial and military applications. New aromatic polyamides have become available which have advantages over the aliphatic polyamides such as higher melting points, higher moduli and higher strengths. These aromatic polyamide fibers fracture quite differently than aliphatic nylon fibers and the investigation of the fracture process is most conveniently conducted by the use of scanning electron microscopy. The potential for high strength in these new aromatic polymers is probably due to extended polymer chains which are broken more nearly in unison during extension. However, the realization of these high strengths with such low elongation fibers depends upon the process of fibrillation to prevent premature catastrophic failure. The strength of the aromatic polyamide Fiber B is contrasted with the strongest nylon tire cord previously available and for the theoretical value calculated on the basis of all primary bonds breaking at once. GRA

N74-16267# Atlantic Research Corp., Alexandria, Va.
DEVELOPMENT AND EVALUATION OF PG/SIC CODEPOSITED COATINGS FOR ROCKET NOZZLE INSERTS. VOLUME 3: SUBSCALE ROCKET MOTOR TESTING OF PG/SiC LINED THROAT INSERTS Special Report, Jan. 1972 - Jul. 1973
Cedric Bielawski and Richard H. Singleton Oct. 1973 45 p
(Contract F04611-72-C-0047; AF Proj. 3148)
(AD-769287; AFRPL-TR-73-70-Vol-3; Rept-46-5544-15-Vol-3) Avail: NTIS CSCL 11/3

Six ATJ graphite 1.0-inch throat diameter nozzle throat inserts and four entrance approach sections were coated with PG/SiC and test fired with a low oxidizing 21 percent aluminum 5600F propellant. A preliminary throat erosion rate for PG/SiC of four mils per second at 2000 psia and seven mils per second at 2500 psia average chamber pressure was established. Use of a graded coating in which the last third of the deposit was pure pyrographite approximately halved the erosion rate. The inserts appeared to be less prone to cracking when the ATJ substrates had been heat treated at 5400F prior to coating. Author (GRA)

N74-16268# Atlantic Research Corp., Alexandria, Va.
DEVELOPMENT AND EVALUATION OF PG/SiC CODEPOSITED COATINGS FOR ROCKET NOZZLE INSERTS. VOLUME 1: THERMAL AND MECHANICAL PROPERTIES OF PYROLYTIC GRAPHITE/SILICON CARBIDE CODEPOSIT Special Report, Jan. 1972 - Jul. 1973
Richard H. Singleton Oct. 1973 247 p refs
(Contract F04611-72-C-0047; AF Proj. 3148)
(AD-769285; Rept-46-5544-13-Vol-1; AFRPL-TR-73-70-Vol-1)

Avail: NTIS CSCL 11/3

The thermal and mechanical properties of PG(Pyrolytic Graphite)/SiC were determined as functions of temperature, 4500F, SiC concentration, to approximately 25 percent, and crystal orientation, a and c directions, of the PG phase. The material was found to be unique in that it is nearly isotropic with respect to thermal expansion and elastic modulus but still quite anisotropic with respect to thermal conductivity. The room temperature tensile strength was much greater than PG in the c direction, as expected as a result of the SiC crystal reinforcement. Tensile strength and elastic modulus were also greater than PG in the ab direction to up 4000F. The data must be considered to be preliminary and nonstatistical. Author (GRA)

N74-16269# Atlantic Research Corp., Alexandria, Va.
DEVELOPMENT AND EVALUATION OF PG/SiC CODEPOSITED COATINGS FOR ROCKET NOZZLE INSERTS, VOLUME 2 Special Report, Jan. 1972 - Jul. 1973
Kenneth E. Undercoffer 1973 93 p refs
(Contract F04611-72-C-0047; AF Proj. 3148)
(AD-769286; Rept-46-5544-11-Vol-2; AFRPL-TR-73-70-Vol-2)
Avail: NTIS CSCL 11/3

Parameters were established to vapor deposit PG/SiC coatings on nozzle components with throat diameters up to 1.7 inches. The coatings were deposited from dilute methane and methyltrichlorosilane in rapidly flowing nitrogen at atmospheric pressure. The coatings were characterized with respect to morphology and SiC content. Coated throat liner components for 1.0-inch throat diameter subscale test nozzles and for 1.7-inch throat diameter HIPPO test nozzles were fabricated. GRA

N74-16270# Army Materials and Mechanics Research Center, Watertown, Mass.
SOME NEW POTENTIAL CERAMIC-METAL ARMOR MATERIALS FABRICATED BY LIQUID INFILTRATION
Michael W. Lindley and George E. Gazza Sep. 1973 23 p refs
(DA Proj. 1T0-62105-A-328)
(AD-769742; AMMRC-TR-73-39) Avail: NTIS CSCL 11/2

An investigation was initiated to explore economical methods of fabricating potential lightweight ceramic armor materials based on liquid metal infiltration processes. Fabrication, microstructural, and limited mechanical property data on ALB12, SiB6, B4C, boron, and various mixtures, infiltrated with liquid silicon and aluminum are presented. The possibility of introducing limited ductility in such ceramic-metal systems and the concept of a gradient armor are considered, and successful preliminary experiments are presented. Author (GRA)

N74-16271# European Research Office, London (England).
REVIEW OF SILICON NITRIDE
William J. Croft and Ivan B. Cutler (ONR, London) 31 Jul. 1973 44 p refs
(AD-769680; ERO-2-73; ONRL-R-16-73) Avail: NTIS CSCL 11/2

With the current engineering effort in developing ceramic materials for vital parts of gas turbine engines, silicon nitride has become a prominent contender for consideration. The properties important for use at high temperatures such as crystal structure, density, thermodynamics, thermal expansion, strength are reviewed. Some of the areas of ignorance and/or controversy are pointed out with the hope of stimulating further research. (Modified author abstract) GRA

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N74-16272 Tennessee Univ., Knoxville.
COMPUTATIONAL METHODS FOR GENERALIZED INVERSE MATRICES Ph.D. Thesis
Linda Marie Lawson 1973 90 p
Avail: Univ. Microfilms Order No. 73-27736

The splitting A = M - N of a real rectangular matrix A is called proper if the range and null spaces of A and M are equal. This idea was developed by R. Plemmons as a means of extending the concept of a regular splitting of a nonsingular matrix. A. Berman and R. Plemmons considered the system Ax = b. This dissertation extends their results in two ways: (1) by considering generalized inverse (g-inverse) matrices, least squares g-inverse matrices, and minimum norm g-inverse matrices in addition to the Moore-Penrose g-inverse, and (2) by weakening the conditions of a proper splitting to requiring only equality of the ranges of A and M when Ax = b may be inconsistent, and only equality of the null spaces of A and M when Ax = b is consistent. In addition, methods are given for constructing proper splittings of special types of matrices. Dissert. Abstr.

N74-16273 Purdue Univ., Lafayette, Ind.
SENSITIVITY ANALYSIS OF LUMPED LINEAR SYSTEM MODELS OF THE RAINFALL-RUNOFF PROCESS Ph.D. Thesis
Nurinisa Usul 1973 258 p
Avail: Univ. Microfilms Order No. 73-28153

The rainfall-runoff process is generally described by mathematical models. The parameters of these models are determined by using observed rainfall and runoff data. The influence of parameter variations upon the model output and the ways in which variations in the components of the rainfall-runoff process influence one another are important aspects of development of models of rainfall-runoff process. These aspects can be investigated in detail by sensitivity analysis which is the main objective of the present study. The basic assumption made in this study for the representation of the rainfall-runoff process is the linearity of the process. The convolution integral representation and the linear differential equation models of the rainfall-runoff process are analyzed. Dissert. Abstr.

N74-16274*# Georgia Univ., Athens. Dept. of Mathematics.
[ABSOLUTE VALUE BOUNDEDNESS, OPERATOR DECOMPOSITION, AND STOCHASTIC MEDIA AND EQUATIONS] Final Report
G. Adomian and Charles C. Miao 5 Jan. 1973 116 p refs
(Grant NGR-11-003-020)
(NASA-CR-130810) Avail: NTIS HC $8.00 CSCL 12A

The research accomplished during this period is reported. Published abstracts and technical reports are listed. Articles presented include: boundedness of absolute values of generalized Fourier coefficients, propagation in stochastic media, and stationary conditions for stochastic differential equations. F.O.S.

N74-16275*# Linguistic Systems, Inc., Cambridge, Mass.
HILBERT MODULAR FUNCTIONS AND DIRICHLET SERIES WITH EULER PRODUCTS
Oscar Herrmann Washington NASA Jan. 1974 76 p refs Transl. into ENGLISH from Math. Ann. (West Germany), v. 27, 1954 p 357-400
(Contract NASw-2482)
(NASA-TT-F-15193) Avail: NTIS HC $6.00 CSCL 12A

Modular forms constructed from h different groups of the form of Hilbert's modular groups are investigated using the domain of the ideal numbers. The domain is decomposed into the h absolute number classes, and a system of matrices is assigned to each class. Each matrix is then assigned a system of representatives and a simultaneous system of linear fractional substitutions. A metric is introduced and a fundamental domain is determined for the substitution group. T-operators are defined for the modular forms and a multiplication theorem for the T-operators is proven. Form vectors are constructed, each from h modular forms, and the application of the T-operators to the form vectors is defined, leading to a simplification of the multiplication theorem. The Fourier coefficients of the form vectors are investigated, and a multiplication formula for the Fourier coefficients of form vectors which are eigenvectors of all T-operators is given. Author

N74-16276# Oulu Univ. (Finland). Aarne Karjalainen Observatory.
POLYTROPIC STELLAR MODELS IN THE PROJECTIVE THEORY OF RELATIVITY
Heikki Kallio 1974 40 p refs
(Rept-15) Avail: NTIS HC $4.00

Polytropic stellar models in the projective theory of relativity are studied. There are solutions very accurately equivalent to general-relativistic polytropes but also quite different solutions, which give very large redshifts. Four topics are discussed: (1) The main features of the projective theory of relativity are represented with a detailed discussion of Heckmann's solution; (2) The projective-relativistic equations of mechanical equilibrium for a fluid sphere are derived and transformed in an adequate dimensionless form; (3) The structural parameters are discussed; (4) The results obtained by numerical integration of field equations are presented. These include representation of the internal structure for some typical cases, a method for determination of the internal structure of a polytrope with a given mass and radius and a brief discussion of the stability. Author

N74-16277# Edinburgh Univ. (Scotland). School of Artificial Intelligence.
SOLVING EQUATIONS INVOLVING ROTATIONS
R. J. Popplestone Jan. 1973 13 p
(MIP-R-99) Avail: NTIS HC $3.00

Machine parts which are put together entirely by fitting cylindrical shafts into cylindrical holes are used to demonstrate equations involving rotations. Specifically, the notion of how the shafts fit the holes is demonstrated. Starting with basic equations of rotations and transformations, a set of rotation equations is developed for engine parts. K.M.M.

N74-16278*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
A SMOOTHING ALGORITHM USING CUBIC SPLINE FUNCTIONS
Robert E. Smith, Jr., Joseph M. Price, and Lona M. Howser Washington Feb. 1974 85 p refs
(NASA-TN-D-7397; L-8945) Avail: NTIS HC $3.75 CSCL 12A

Two algorithms are presented for smoothing arbitrary sets of data. They are the explicit variable algorithm and the parametric variable algorithm. The former would be used where large gradients are not encountered because of the smaller amount of calculation required. The latter would be used if the data being smoothed were double valued or experienced large gradients. Both algorithms use a least-squares technique to obtain a cubic spline fit to the data. The advantage of the spline fit is that the first and second derivatives are continuous. This method is best used in an interactive graphics environment so that the junction values for the spline curve can be manipulated to improve the fit. Author

N74-16279# Ecole Nationale Superieure de Techniques Avancees, Paris (France).
SINGULAR PERTURBATIONS [PERTURBATIONS SINGULIERES]
C. Francois 1973 49 p refs In FRENCH Conf. presented at the CEA, Limeil, France, 16 Jan. 1973
(Rept-022) Avail: NTIS HC $4.50

The problem of adequate asymptotic series expansion for approximate solutions of a problem depending on a parameter with a given limit is presented. Definitions of regular and singular perturbations are given, and indications of matched asymptotic approximation on the multiple ladder method are presented. The conditions for successful use of these two methods are discussed. Applications to general mechanics, fluid mechanics, the beam and sheet bending theory, the St. Venant problem, and differential equations are outlined. ESRO

N74-16280# Defence Research Information Centre, Orpington (England).
THE FAST FOURIER TRANSFORM (FFT) IN THE COMPUTERISED ANALYSIS OF ANALOG AND DIGITAL LINEAR SYSTEMS
U. Mazzei Oct. 1973 31 p refs Transl. into ENGLISH from Elettronica e Telecom. (Turin), v. 21, Nov./Dec. 1973, p 225-233
(DRIC-Trans-3279; BR30607) Avail: NTIS HC $3.75

Theoretical and practical aspects of the Fast Fourier Transform (FFT) are described. These aspects make it possible to carry out Fourier analyses using a computer at high speeds and with high precision. Various aspects relating to FFT application to the analysis of digital and analog systems were examined. Some illustrative examples of its application to problems relating to linear filters are also given. Computer programs are described. ESRO

N74-16281# Helsinki Univ. of Technology, Otaniemi (Finland).
ON THE SQUARE-ROOTS OF DYADICS
Ismo V. Lindell 14 Oct. 1973 13 p refs Sponsored by Fulbright Grant to Ill. Univ., Urbana
(Rept-S-57) Avail: NTIS HC $3.00

The solutions of the dyadic quadratic equation direct product of A double bar and A double bar equals B double bar were obtained by using dyadic operations. The problem was reduced to a scalar algebraic equation of fourth degree, from which solutions the square root dyadics A double bar can be obtained. It is shown that a positive definite dyadic possesses one and only one positive definite square root. A comparison with the well known matrix method was also made. Author (ESRO)

N74-16282# California Univ., Berkeley. Operations Research Center.
A GENERALIZED GRADIENT IN OPTIMAL CONTROL
David D. Barnett Jul. 1973 92 p refs
(Contract DA-31-124-ARO(D)-331; Grant NSF GP-30961)
(AD-767552; ORC-73-12) Avail: NTIS CSCL 12/1

Gradient methods or methods of steepest descent in control-space have been found to be quite useful for the numerical solution of a large class of problems in optimal control. However, there is a large class of problems for which these methods have not been successful. To deal with this larger class of problems, a generalized gradient method is proposed. The convergence rate of this method is analyzed for a certain class of problems and the analysis is verified numerically. The analysis is then used to suggest improvements in the basic algorithm. Author (GRA)

N74-16283# Aerospace Corp., El Segundo, Calif. Guidance and Control Div.
PSEUDO STATE MEASUREMENTS APPLIED TO RECURSIVE NONLINEAR FILTERING Report for Jul. 1972 - Jan. 1973
David W. Whitcombe 30 Nov. 1972 33 p refs
(Contract F04701-72-C-0073)
(AD-767189; TR-0073(3115)-2; SAMSO-TR-73-265) Avail: NTIS CSCL 12/1

Pseudo state measurements are constructed to make the measurement (geometry) model linear in the state. In the past, linear measurements have often proved to give better state estimates than nonlinear measurements. They are nonlinear functions of the actual measurement model bias parameters and are constructed to be linear functions of the state variables or to vanish in the absence of model or measurement error. Some examples of constructing pseudo state measurements are given in the paper. Recursive filter equations are derived using the pseudo state measurements and including colored (Markov) measurement noise and unestimated state and measurement model parameters. The filter estimates minimize the usual weighted least squares cost function with correlated state and pseudo state measurements. The filter is linear by construction. Higher order partial derivatives, if retained, would appear only in the computation of error variance and covariance matrices. Author (GRA)

N74-16284# Texas Univ., Austin. Electronics Research Center.
IDENTIFICATION AND CONTROL OF LINEAR STOCHASTIC SYSTEMS USING SPLINE FUNCTIONS
Jayant G. Deshpande and Demetrios G. Lainiotis 1 May 1973 218 p refs
(Contract F44620-71-C-0091; Grant AF-AFOSR-1764-69; AF Proj. 4751)
(AD-766920; TR-145; AFOSR-73-1646TR) Avail: NTIS CSCL 12/1

The report discusses parameter identification and adaptive control of linear plants excited by white, Gaussian noise, the linear observations being made in the presence of additive white, Gaussian noise. The Bayesian approach is taken throughout this study. As this approach leads to identification and control schemes which cannot be implemented exactly, the spline functions are

used to approximate these schemes very closely. These approximations are studied in detail and their performance is demonstrated by means of several examples. GRA

N74-16285# Aerospace Research Labs., Wright-Patterson AFB, Ohio. Applied Mathematics Research Lab.
A UNIFIED VIEW OF SOME METHODS FOR STIFF TWO-POINT BOUNDARY VALUE PROBLEMS Interim Report
Karl G. Guderley Oct. 1973 87 p refs
(AF Proj. 7071)
(AD-769479; ARL-73-0135) Avail: NTIS CSCL 12/1

The paper analyses a number of known methods for the solution of two point boundary value problems for ordinary differential equations; the methods considered have in common that they lead to a sequence of initial value problems. A routine approach fails if the differential equations are stiff. In geometric terms, all methods perform the same basic task; they determine a sequence of loci in a vector space to which the solution is confined. Even in stiff equations the loci are well defined, but the vectors used to describe them have a tendency to become more and more parallel unless one takes special measures. The method of Godunov-Conte and the parallel shooting method of Keller periodically change the basis used for the representation of the loci; the method of Guderley-Nikolai introduces an x dependent representation for the loci which changes only if subspaces parallel to them change. In this manner the loss of accuracy can be controlled by all methods. (Modified author abstract) GRA

N74-16286# Weibull (Waloddi), Lausanne (Switzerland).
THE RANK-SCORE TEST - AN IMPROVEMENT OF THE RANK-SUM TEST Technical Report, 15 Mar. - 15 Apr. 1973
Waloddi Weibull Aug. 1973 19 p refs
(Contract F44620-73-C-0066)
(AD-769451; AFML-TR-73-203) Avail: NTIS CSCL 12/1

The hypothesis that two random samples are from identically distributed but unknown populations can be tested by use of the rank-sum as the test statistic. It is proposed to substitute for it the rank-score, which, as pointed out, supplies more information about the populations of the samples under examination. This new statistic is defined and its main properties are indicated. Tables for its application to pseudo-standardized samples have been established by use of two computer programs, thereby enabling tests of the hypothesis that the samples are from populations with identical distribution function, including its shape parameter, if any, but possibly different scale and location parameters. The practical use of the new test has been demonstrated by numerical examples concerning samples of fatigue test data from a large collection prepared at the Boeing Company. Author (GRA)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N74-16287 Rutgers Univ., New Brunswick, N.J.
MEDIUM AND LARGE SCALE DISTURBANCES OF A DEEP BAROCLINIC FLUID Ph.D. Thesis
Jae Min Hyun 1973 153 p
Avail: Univ. Microfilms Order No. 73-27940

A study was made of the baroclinic instability of zonal wind by modifying the Eddy model through relaxation of the shallow layer approximation. The undisturbed zonal wind satisfies the geostrophically-balanced thermal wind relation, with constant vertical shear. The deep-fluid effect shows up under two conditions: (1) minimal attainment of hydrostatic approximation in the momentum equation; (2) appreciable amount of mass-divergence in the continuity equation. The linearized perturbation equation is treated as an eigenvalue problem. Sinusoidal disturbances are assumed, and a positive nonzero imaginary part of the complex phase velocity gives rise to instability. The results indicate that the nonhydrostatic effect primarily reduces the growth rates, while the mass-divergence effect, which shows small latitudinal wavenumber dependence, decreases the wave propagation speeds. Dissert. Abstr.

N74-16288 Florida State Univ., Tallahassee.
THE LIFE CYCLE OF THE FLORIDA KEYS WATERSPOUT AS THE RESULT OF FIVE INTERACTING SCALES OF MOTION Ph.D. Thesis
Joseph Hilary Golden 1973 397 p
Avail: Univ. Microfilms Order No. 73-30281

Detailed quantitative analyses of data collected from aircraft and land based observing systems during the 1969 Lower Florida Keys Waterspout Project were synthesized to show that waterspouts are not random events, as suggested by previous literature, but have a characteristic life cycle. This life cycle consists of five discrete but overlapping states: (1) the dark spot stage, characterized by a prominent circular lightcolored disc on the sea surface surrounded by a dark patch which is diffuse on its outer edges, (2) the spiral pattern stage, characterized by the development of alternating dark- and light-colored surface bands in spiral pattern around the dark spot, (3) the spray ring (incipient spray vortex) stage where a concentrated spray ring develops around the dark spot, with a lengthening funnel above, (4) the mature waterspout stage in which the spout reaches maximum overall organization and intensity, and (5) the decay stage where waterspout dissipation (often abrupt) is reinforced by cool downdrafts from a nearby developing rainshower. Dissert. Abstr.

N74-16289 Purdue Univ., Lafayette, Ind.
KINETIC ENERGY TRANSFER PROCESSES DURING AN EXTRATROPICAL CYCLONE Ph.D. Thesis
Long Nan Chang 1973 123 p
Avail: Univ. Microfilms Order No. 73-28053

A diagnostic analysis of the kinetic energy transfer processes during the life history of an extratropical cyclone is presented. Rawinsonde data taken at 0000 GMT and 1200 GMT for a two period (March 20-21, 1962) spanning the developing, mature, and occluded stages of the cyclone is used in this study. The total kinetic energy budget of the storm system is studied in a quasi-Lagrangian system which allows for expansion and movement of the boundaries. Also the kinetic energy budget of large scale atmospheric waves is examined by decomposing the total kinetic energy budget into various eddy components. The latter approach utilizes a set of orthonormal functions constructed by a Gram-Schmidt orthonormalization process based on sine and cosine series. Dissert. Abstr.

N74-16290 Purdue Univ., Lafayette, Ind.
A KINETIC ENERGY STUDY OF HURRICANE CELIA, 1970 Ph.D. Thesis
William Raymond Gommel 1973 168 p
Avail: Univ. Microfilms Order No. 73-28079

A new approach is utilized in the determination of the kinetic energy budget of a tropical cyclone. The technique employs small regions (6 degrees of latitude by 8 degrees of longitude) at different locations approximately centered on the cyclone as it moved through a larger region (12 degrees of latitude by 16 degrees of longitude). This permits computation of the kinetic energy effects due to the storm alone and is the first time that an attempt has been made to do a complete kinetic energy budget for a tropical cyclone over land. Using this approach to isolate the storm showed that the kinetic energy generation within Hurricane Celia was an order of magnitude larger than the horizontal boundary flux. Thus, the boundary flux of kinetic energy was essentially insignificant compared to the kinetic energy generation. The diagnostic study is based on surface and rawinsonde data up to 100 mb for two consecutive 12-hour periods beginning 0000 GMT on 4 August 1970 and a subsequent 24-hour period from 0000 GMT on 5 August to 0000 GMT on 6 August. Dissert. Abstr.

N74-16291 Centre National de la Recherche Scientifique, Paris (France). Lab. de Meteorologie Dynamique.
STRATOSPHERIC VERTICAL WIND SHEAR Final Report [ETUDE DU CISAILLEMENT VERTICAL DU VENT DANS LA STRATOSPHERE RAPPORT FINAL]
P. Morel and D. Cadet Dec. 1972 27 p refs In FRENCH
(Contract DGRST-70-0-2171)

HC $3.50

Stratospheric vertical wind shear was studied by means of propeller type, differential anemometers and simplified fluxgate magnetometers on board hgih altitude, long duration ballon flights. The instrument package is detailed. Ten flights were performed, two of which yielded round-the-earth data at one second intervals during blocks of four to six hours. The RMS intensity (0.02/sec) and horizontal rotation of the wind shear in the lower stratosphere are determined exhibiting the stratified flow structure with a vertical scale length of about 100 meters. Application of these results to the anomal turbulent diffusion exhibited by the Eole balloons is discussed. Application of the anemometer to the Essor balloon is discussed. ESRO

N74-16292*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

TERRESTRIAL ENVIRONMENT (CLIMATIC) CRITERIA GUIDELINES FOR USE IN AEROSPACE VEHICLE DEVELOPMENT, 1973 REVISION

Glenn E. Daniels, ed. 5 Jul. 1973 472 p refs Revised (NASA-TM-X-64757) Avail: NTIS HC $25.75 CSCL 04B

Guidelines are provided on probable climatic extremes and terrestrial environment data applicable to space vehicle and associated equipment design and development. Operational criteria for ground support sites are emphasized. For individual titles, see N74-16293 through N74-16311.

N74-16293* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

INTRODUCTION

Glenn E. Daniels and William W. Vaughan *In its* Terrest. Environ. (Climatic) Criteria Guidelines for use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 9 p refs (For availability see N74-16292 07-20)

CSCL 04B

Probable climatic extremes of terrestrial environment data specifically applicable for NASA space vehicles and associated equipment development are considered. Design guideline values are established for the following environmental parameters: (1) Thermal (temperature and solar radiation); (2) humidity; (3) precipitation; (4) winds; (5) pressure; (6) density; (7) electricity (atmospheric); (8) corrosion (atmospheric); (9) sand and dust; (10) fungi and bacteria; (11) atmospheric oxidants; (12) composition of the atmosphere; and (13) inflight thermodynamic properties. Author

N74-16294* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

THERMAL

Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 33 p refs (For availability see N74-16292 07-20) CSCL 04B

One of the more important environmental influences on a vehicle is the thermal environment. Combinations of air temperature, solar radiation, and sky radiation can cause various structural problems. Some example of potential problems are: (1) Heating of one side of the vehicle by the sun while the other side is cooled by a clear sky causes stresses since the vehicle sides will be of different length; (2) the temperature of the fuel influences the volume/mass relationship; and (3) too high a temperature may destroy the usefulness of a lubricant. The heating or cooling of a surface by air temperature and radiation is a function of the heat transfers taking place; therefore, methods of determining these relationships are presented. Author

N74-16295* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

HUMIDITY

Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 14 p refs (For availability see N74-16292 07-20) CSCL 04B

The glossary contains atmospheric and ground vapor concentration data on the various NASA space vehicle development and operation sites for consideration by the vehicle design engineer. G.G.

N74-16296* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

PRECIPITATION

In its Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 33 p refs (For availability see N74-16292 07-20)

CSCL 04B

Precipitation is usually defined as all forms of hydrometeors, liquid or solid, which are free in the atmosphere and which reach the ground. In this report the definition is extended to those hydrometeors which do not reach the ground, but impinge on a flying surface, such as space vehicles. Accumulation is reported in depth over a horizontal surface; i.e., millimeters or inches for the liquid phase and in depth or equivalent depth of water equivalent for the frozen phase. Author

N74-16297* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

WIND

Margaret B. Alexander, S. Clark Brown, Dennis W. Camp, Glenn E. Daniels, Lee W. Falls, George H. Fichtl, Kelly Hill, John Kaufman, Orvel E. Smith, and William W. Vaughan *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 168 p refs (For availability see N74-16292 07-20)

Avail: NTIS CSCL 04B

A space vehicle's response to atmospheric disturbances includes many parameters, the choice of criteria (parameters) depending upon the vehicle configuration and the specific mission. Response calculation methods for all phases of vehicle design are separated into their various phases and parts, using different approaches and methods of evaluation, as the particular phase demands. Although not independent, these phases include: (1) preliminary design; (2) final structural design; (3) guidance and control system design and optimization (preliminary and final); and (4) establishment of limits and procedures for launch and flight operations. Thus, the proper selection, representation, and use of wind information require the skillfully coordinated efforts of aerospace meteorologists and engineers. Author

N74-16298* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ABRASION

Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 5 p refs (For availability see N74-16292 07-20) CSCL 04B

Particle erosion of spacecraft surface is considered in aerospace vehicle and associated facility designs. When the speed of the spacecraft with relation to atmospheric suspended particles is high, erosion occurs even when the particles have a hardness less than the exposed surface. Surface impact damage parameters are developed for sand, dust, raindrops, snow, and hail particles at earth surface and at altitude. G.G.

N74-16299* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ATMOSPHERIC PRESSURE (SURFACE)

Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 2 p ref (For availability see N74-16292 07-20) CSCL 04B

The total variation of pressure from day to day is relatively small. Rapid but slightly greater variations occur as the result of the passage of frontal systems, while the passage of a hurricane can cause somewhat larger, but still not significant changes for pressure environment design of space vehicles. Surface pressure extremes for various locations and their extreme ranges are given. These data use the results of a study of pressure extremes. Author

N74-16300* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

ATMOSPHERIC DENSITY (SURFACE)

Glenn E. Daniels and S. Clark Brown *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 3 p refs (For availability see N74-16292 07-20)

CSCL 04B

The variation of the density of the atmosphere at the surface from the average for any one station, and between the areas of interest, is small and should have no important effect on preflight spacecraft operations. The median density at the surface for five test ranges is given. Author

N74-16301* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC ELECTRICITY **c13**
Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 28 p refs (For availability see N74-16292 07-20)
CSCL 04A

Atmospheric electricity must be considered in the design, transportation, and operation of aerospace vehicles. The effect of the atmosphere as an insulator and conductor of high voltage electricity, at various atmospheric pressures, must also be considered. The vehicle can be protected as follows: (1) By insuring that all metallic sections are connected by electrical bonding so that the current flow from a lightning stroke is conducted over the skin without any gaps where sparking would occur or current would be carried inside; (2) by protecting buildings and other structures on the ground with a system of lightning rods and wires over the outside to carry the lightning stroke into the ground; (3) by providing a zone of protection for launch complexes; (4) by providing protection devices in critical circuits; (5) by using systems which have no single failure mode; and (6) by appropriate shielding of units sensitive to electromagnetic radiation. Author

N74-16302* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC CORROSION
Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 4 p refs (For availability see N74-16292 07-20)
CSCL 04A

The atmosphere near the ocean causes corrosion of exposed metals. Wind moving over breaking sea waves will pick up small droplets of salt water. These droplets are small enough to remain suspended in the air. Some will evaporate and leave tiny particles of salt in the air. When these droplets and particles accumulate on surfaces and dry, a film of salt remains on the surface. When the relative humidity is near saturation, or when light rain or drizzle occurs, the salt on the surface will absorb water and form a highly conductive solution. Corrosion by electrolytic action results when two dissimilar metals are involved, and corrosion of a single metal occurs when the solution can react chemically. Fallout of salt particles at eastern test range is reported. Author

N74-16303* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FUNGI AND BACTERIA **c04**
Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 2 p refs (For availability see N74-16292 07-20)
CSCL 06M

Spacecraft equipment is usually protected from fungi and bacteria by incorporating a fungicide-bactericide in the material, by a fungicide-bactericide spray, or by reducing the relative humidity to a degree where growth will not take place. A unique method to protect delicate, expensive bearings in equipment was to maintain a pressure (with dry air or nitrogen) slightly above the outside atmosphere (few millibars) within the working parts of the equipment, thus preventing fungi from entering equipment. Author

N74-16304* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC OXIDANTS
Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 3 p refs (For availability see N74-16292 07-20)
CSCL 04A

The ingredients which cause the air pollution are a mixture of oxides of organic matter (mostly nitrogen oxides and hydrocarbons) and ozone. Ozone, although considered one of the rare atmospheric gases, needs consideration in spacecraft design because of its chemical reaction (oxidation) with organic materials, especially rubber, which becomes hard and brittle under tension in a few minutes time. At the earth surface, a maximum of 60 parts per hundred million of oxidants composed of nitrogen oxides, hydrocarbons, sulphur dioxide, sulphur trioxides, peroxides, and ozone can be expected for 72 hours when smog occurs. A table representing distribution of ozone concentration with atmospheric altitude is included. Author

N74-16305* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC COMPOSITION
Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 3 p refs (For availability see N74-16292 07-20)
CSCL 04A

The earth's atmosphere is made up of a number of gases in different relative amounts. Near sea level and up to about 90 km, the amount of these atmospheric gases in clean, relatively dry air is practically constant. Four of these gases, nitrogen, oxygen, argon, and carbon dioxide, make up 99.99 percent by volume of the atmosphere. Two gases, ozone and water vapor, change in relative amounts, but the total amount of these two is very small compared to the amount of the other gases. The atmospheric composition shown in a table can be considered valid up to 90 km geometric altitude. Above 90 km, mainly because of molecular dissociation and diffusive separation, the composition changes. Author

N74-16306* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INFLIGHT THERMODYNAMIC PROPERTIES **c33**
S. Clark Brown, Glenn E. Daniels, Dale L. Johnson, and Orvel E. Smith *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 34 p refs (For availability see N74-16292 07-20)
CSCL 20M

The inflight thermodynamic parameters (temperature, pressure, and density) of the atmosphere are presented. Mean and extreme values of the thermodynamic parameters given here can be used in application of many aerospace problems, such as: (1) research and planning and engineering design of remote earth sensing systems; (2) vehicle design and development; and (3) vehicle trajectory analysis, dealing with vehicle thrust, dynamic pressure, aerodynamic drag, aerodynamic heating, vibration, structural and guidance limitations, and reentry analysis. Atmospheric density plays a very important role in most of the above problems. A subsection on reentry is presented, giving atmospheric models to be used for reentry heating, trajectory, etc., analysis. Author

N74-16307* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DISTRIBUTION OF SURFACE EXTREMES IN THE UNITED STATES
Glenn E. Daniels and Orvel E. Smith *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 19 p refs (For availability see N74-16292 07-20)
CSCL 04B

Extreme design environment data are presented for consideration in aerospace vehicle transportation, fabrication, or testing. Values were obtained by using data from weather stations and published meteorological articles. Maps depict snow fall, hail distribution, atmospheric pressure, atmospheric temperature, and surface elevations. Author

N74-16308* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ATMOSPHERIC ATTENUATION RELATIVE TO EARTH-VIEWING ORBITAL SENSORS **c13**
S. Clark Brown and Robert R. Jayrde, Jr. *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 21 p refs (For availability see N74-16292 07-20)
CSCL 04A

Earth viewing space missions offer exciting new possibilities in several earth resources disciplines - geography, hydrology, agriculture, geology, and oceanography, to name a few. A most useful tool in planning experiments and applying space technology to earth observation is a statistical description of atmospheric parameters. Four dimensional atmospheric models and a world wide cloud model are used to produce atmospheric attenuation models to predict degradation effects for all classes of sensors for application to earth sensing experiments from spaceborne platforms. To insure maximum utility and application of these products, the development of an interaction model of microwave energy and atmospheric variables provides a complete description of the effects of atmospheric moisture upon microwaves.
Author

N74-16309* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
WORLDWIDE SURFACE EXTREMES
Glenn E. Daniels *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 11 p refs (For availability see N74-16292 07-20)
CSCL 04A

Information needed to fabricate, transport, test, and launch space vehicles requires statistical meteorological data for various geographical areas. A brief review of world surface extremes is presented that illustrates the large extremum values that occur in some global areas and compares them with those currently used in space vehicle design.
Author

N74-16310* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SEVERE WEATHER, SEA STATE, AND SELECTED CLIMATOLOGIES
S. Clark Brown, George H. Fichtl, and Orvel E. Smith *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 28 p refs (For availability see N74-16292 07-20)
CSCL 04B

With the development of aerospace launch vehicles which are to be recovered by flying back to the earth's surface, additional climatic data are needed on specific landing sites. A short discussion is presented that includes tornadoes, hurricanes, tropical storms and effects of sea states.
Author

N74-16311* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ENVIRONMENT HAZARD ESTIMATES
John W. Kaufman, J. Briscoe Stephens, C. Kelly Hill, and M. Susko *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 21 p refs (For availability see N74-16292 07-20)
CSCL 04A

Emission into the atmosphere of aerospace vehicle exhaust effluents and by-products is considered by using atmospheric diffusion models to calculate downwind concentrations and dosages from various engine and solid rocket booster (SRB) exhaust by-products. A major effort is being made to gather detailed data on the chemical reactions that take place between the exhaust effluents and the atmosphere. Basic diffusion estimation formulas consider normal exhaust releases, abnormal releases, leaks, and inadvertent spills. Cloud rise formulas for use in source identification are included and meteorological inputs covered.
Author

N74-16312# Tokyo Metropolitan Research Inst. for Environmental Protection (Japan).
ELIMINATING POLLUTION AND CREATING A GENERAL EQUILIBRIUM MODEL INCLUDING THE ENVIRONMENT
T. Nambu and K. Aoki [1973] 9 p
Avail: NTIS HC $3.00

The effect of governmental intervention in eliminating environmental pollution is analyzed by using an equilibrium model, which considers goods, labor, and the life environment. The assistance (subsidies) of the government to production activities in eliminating pollution is discussed along with combatting environmental pollution generated by the concentration of people.
F.O.S.

N74-16313# Swiss Inst. of Meteorology, Zurich.
FORECASTS OF FOG AT GENEVA-COINTRIN AIRPORT [PREVISION DES BROUILLARDS A L'AEROPORT GENEVE-COINTRIN]
A. Chambettaz, A. Korten, and M. Dupanloup Sep. 1971 27 p refs In FRENCH; ENGLISH summary
(Rept-27) Avail: NTIS HC $3.50

Statistical methods were used in an attempt to improve forecasts of poor visibilities at the airport of Geneva-Cointrin. The main methods applied were stepwise multiple regression and stepwise discriminant analysis.
Author

N74-16314# Osservatorio Ticinese, Locarno-Monti (Switzerland).
THE THUNDERSTORM CONDITIONS IN THE SOUTHERN CENTRAL ALPS AND IN THE BEGINNING ALPS (CONTINUATION OF NO. 22). 2: SINGULAR THUNDERSTORMS AND THEIR DISTRIBUTION. 3: THE DURATION OF THUNDERSTORMS [DIE GEWITTERVERHAELTNISSE IN DEN SUEDLICHEN ZENTRALALPEN UND VORALPEN (FORTSETZUNG VON NR. 22). 2: DIE EINZELNEN GEWITTER UND IHRE VERTEILUNG. 3: DIE DAUER DER GEWITTER]
E. Zenone 1972 31 p refs In GERMAN; ENGLISH summary
(Rept-27) Avail: NTIS HC $3.75

The different types of thunderstorms occurring on days with perturbations were analyzed. Probably because of the shortness of the observational series the distribution is very broad, especially in case of thunderstorms with southerly upper air current (Sudstau). The distribution clearly proves the maximum frequency in the region of the Centovalli and the Gridone, then a rapid decrease from there to Cevio and a much slower decrease from Cevio to Bedretto. A further maximum of local thunderstorms is presumed in the region of Bedretto. Days with the highest number of thunderstorms belong to the Sudstau type, whereas local thunderstorms show the lowest frequencies. The latter have a higher percentage of frequency for all cases with only one thunderstorm per day with perturbation, the cases of Sudstau on the other hand show the lowest frequencies of all three types of thunderstorms. There have never occurred more than 10 local thunderstorms a day, whereas the cases of Sudstau, on days with more than 10 thunderstorms, show frequencies up to 4%, according to the station.
Author

N74-16315# Swiss Inst. of Meteorology, Zurich.
ANALYSIS OF RAINFALL IN CENTRAL VALAIS [ANALYSE DE LA PLUVIOSITE DANS LE VALAIS CENTRAL]
J. Catzeflis, B. Primault, and H. Strehler 1972 16 p refs In FRENCH; ENGLISH summary
Avail: NTIS HC $3.00

Precipitations in a dry climate, as in Valais, are very important for all human activities, but especially for farmers. The frequency of rainfalls below a certain limit indicates the necessity of irrigation. Irrigations bring a multiple of potential daily evapotranspiration. A weekly synopsis of the precipitations was carried out. At that time it was also discovered that strong or frequent irrigations had the contrary effect during certain periods (especially in August). The distribution of the precipitations during a day's time had also an effect on the farmwork.
Author

N74-16316# Swiss Inst. of Meteorology, Zurich.
FOEHN- OR WEATHER-SENSITIVITY AND BIOCLIMATOLOGY [FOEHN- ODER WETTERFUEHLIGKEIT UND BIOKLIMA]
G. A. Gensler 1972 16 p refs In GERMAN
Avail: NTIS HC $3.00

Meteorological aspects of human bioclimatological responses to katabatic winds along leeward mountain sides are considered. It is shown that human weather sensitivity increases during passing of low pressure zones; it is most pronounced during eastward drifting low pressure air turbulence in a general western atmospheric circulation that induces an influx of warm moist air from the south or southwest and is followed by precipitation and temperature inversion in the cold air layer near ground. This shift in warm wind and weather irritates the nervous system and produces complaints of migraine, irritability, insomnia,

lethargy, and sleepiness as well as heart and asthma attacks in susceptible persons. Transl. by G.G.

N74-16317# National Weather Service, Silver Spring, Md.
NATIONAL WEATHER SERVICE HEAVY SNOW FORECAST VERIFICATION, 1962 - 1972
Alexander F. Sadowski and Geraldine F. Cobb Jan. 1974 32 p refs
(NOAA-TM-NWS-FCST-20) Avail: NTIS HC $3.75

The National Weather Service's heavy snow verification program is presented from its inception for the winter of 1962-1963 through the winter of 1971-1972. During these 10 winters, verification was performed on an areal basis. The scores show fluctuations with a trend of gradual improvement in heavy snow forecasts. The National Meteorological Center scored higher than the field offices in this comparative heavy snow verification program. Author

N74-16318# Woods Hole Oceanographic Institution, Mass.
OBSERVATIONS AND INTERPRETATION OF TURBULENCE, WIND VARIATIONS AND SHOWERS IN THE TROPICAL MARINE BOUNDARY LAYER
Andrew F. Bunker Dec. 1973 69 p refs
(Grant NSF GA-31568)
(WHOI-73-90) Avail: NTIS HC $5.50

Measurements of turbulence and turbulent fluxes made from a C-54Q aircraft during BOMEX are summarized and compared with measurements made by other groups. Variance of the velocity components and the momentum flux agreed well with the values of others, but the variance of mixing ratio and water vapor flux were less than one third the values obtained by others. Most of the measurements of the turbulence and fluxes were made in the sub-cloud layer of the tropical boundary layer. The vertical turbulent velocities increase with height above the surface to about 300m and then decrease in the stable air of the cloud layer. The shearing stress decreases gradually to about 350m and then drops rapidly to a small value. Fluctuations of the temperature decrease above the surface layer to a minimum in the region of the potential temperature minimum and then increase in the cloud layer. The heat flux is small in the surface layer and becomes negative near the potential temperature minimum. The distribution of showers, turbulence and other parameters within the large-scale disturbances were measured and averaged. Author

N74-16319# Weapons Research Establishment, Salisbury (Australia).
MEASUREMENTS OF THE BASIC ATMOSPHERIC PARAMETERS AT WOOMERA USING THE FALLING SPHERE, JULY - DECEMBER 1972
P. H. O. Pearson Aug. 1973 59 p refs
(WRE-TN-1002(WR/D)) Avail: NTIS HC $5.00

During the second half of 1972 falling sphere experiments were continued on a monthly basis at approximately 6 deg solar depression in the evening about 30 min. after sunset. Six results are presented for atmospheric density, temperature, pressure, and wind components covering an altitude band of 30 to 100 km. Density, temperature, and pressure values are compared with those given by relevant models of the atmosphere. Author

N74-16320# RAND Corp., Santa Monica, Calif.
AIR POLLUTION AND POWER PLANT SITING IN CALIFORNIA
R. A. Papetti, S. H. Dole, and M. Hammer Mar. 1973 61 p refs
(Contract LCB-21001; Grant RF-71015)
(R-1128-RF/CSA) Avail: NTIS HC $5.25

The relative contributions of power plant emissions to air pollution were established in California. The extensive body of laws, regulations, and government organizations are described for achieving and maintaining air quality adequate to protect public health and welfare. The governmental control of air pollution currently exercised over fuel burning by stationary sources in California is also discussed. The control methods are summarized for power plant operators to achieve compliance with air pollution regulations and to make some rough estimates of control costs. The major elements of air pollution control activities are identified, along with possible relationships of these to a power plant siting authority. Author

N74-16321*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DATA FOR FIRST NASA ATMOSPHERIC VARIABILITY EXPERIMENT (AVE 1). PART 2: GRAPHICAL PRESENTATION OF DATA
James R. Scoggins and Orvel E. Smith Washington NASA Dec. 1973 264 p Prepared in cooperation with Tex. A and M Univ., College Station
(Contract NAS8-26751)
(NASA-TM-X-2948) Avail: NTIS HC $6.25 CSCL 04B
For abstract, see N74-15350.

N74-16322*# Pennsylvania State Univ., University Park.
DETERMINATION OF CRITICAL NONDIMENSIONAL PARAMETERS IN AIRCRAFT DYNAMIC RESPONSE TO RANDOM INPUT Topical Report, Nov. 1972 - Jun. 1973
Stanley E. Hillard and Maurice M. Sevik Washington NASA Jan. 1974 153 p refs
(Contract NAS8-27334)
(NASA-CR-2361) Avail: NTIS HC $4.75 CSCL 01A

The critical parameters of subsonic jet aircraft response in a random atmospheric environment are determined. Equations of motion are presented for semirigid aircraft with a flexiable primary airfoil. However, the analysis is easily extendable to include additional appendage flexibility. The analysis establishes the mechanical admittance values for pitching, plunging, and the first mode effects from wing elastic bending and torsion. Nondimensional parameters are established which allow the representation of all subsonic jet transport aircraft with one nondimensional model. The critical parameters for random forcing are found to be aircraft relative mass, reduced natural and forcing frequencies, and Mach number. Turbulence scale lengths are found to be directly related to the critical values of reduced forcing frequency. Results are given for subsonic craft traveling at constant altitude. Specific values of admittance functions are tabulated at Mach numbers of 0.2, 0.5, and 0.7. The relative mass range covers all aircraft currently in operation. Author

N74-16323# Commonwealth Scientific and Industrial Research Organization, Sydney (Australia). Div. of Cloud Physics.
RESEARCH ACTIVITIES
May 1973 27 p Original contains color illustrations
Avail: NTIS HC $3.50

Research is reported in cloud physics which centers on the following topics: (1) the size, nature, and origin of the nuclei of condensation; (2) the size distribution of the droplets formed by condensation, and its relation to the spectrum of nuclei; (3) the role of a turbulent updraft in a convective cloud in droplet growth and cloud behavior; (4) the size and origin of the nuclei which stimulate freezing and upon which ice crystals grow; and (5) the ice crystal form and concentration in natural clouds and its relationship to the ice nucleus spectrum. An investigation of the bouyant thermals which transport heat and vapor upwards from the earth's surface and result in cloud formation is also reported. Author

N74-16324*# Techtran Corp., Glen Burnie, Md.
THE METEOR SPACE SYSTEM
Washington NASA Feb. 1974 8 p Transl. into ENGLISH of the publ. "Kosmicheskaya Sistema Meteor" Leningrad, Nauka p 2-6
(Contract NASw-2485)
(NASA-TT-F-15362) Avail: NTIS HC $3.00 CSCL 04B

The Soviet experimental Meteor weather satellite system, developed in 1967, was designed to improve accurate long-range global weather forecasting. The operation of the satellite and earth-based data collection, and processing systems are discussed. The system incorporates television, infrared and actinometric instruments. Author

N74-16325*# Environmental Research and Technology, Inc., Lexington, Mass.
ANALYSIS OF AIRCRAFT MICROWAVE MEASUREMENTS OF THE OCEAN SURFACE Final Report, Aug. 1972 - 4 Aug. 1973

James H. Willand, Mary Grace Fowler, Edward C. Reifenstein, III, and David T. Chang Dec. 1973 185 p refs
(Contract NAS5-21828)
(NASA-CR-132923; P-442) Avail: NTIS HC $11.25 CSCL 04B

A data system was developed to process, from calibrated brightness temperature to computation of estimated parameters, the microwave measurements obtained by the NASA CV-990 aircraft during the 1972 Meteorological Expedition. A primary objective of the study was the implementation of an integrated software system at the computing facility of NASA/GSFC, and its application to the 1972 data. A single test case involving measurements away from and over a heavy rain cell was chosen to examine the effect of clouds upon the ability to infer ocean surface parameters. The results indicate substantial agreement with those of the theoretical study; namely, that the values obtained for the surface properties are consistent with available ground-truth information, and are reproducible except within the heaviest portions of the rain cell, at which nonlinear (or saturation) effects become apparent. Finally, it is seen that uncorrected instrumental effects introduce systematic errors which may limit the accuracy of the method. Author

N74-16326# Environmental Prediction Research Facility (Navy), Monterey, Calif.
CHANGES IN THE CHARACTERISTICS OF TYPHOONS CROSSING THE ISLAND OF TAIWAN
Samson Brand and Jack W. Bielloch Oct. 1973 23 p refs
(AD-769538; ENVPREDRSCHFAC-TP-8-7323) Avail: NTIS CSCL 04/2

Twenty-two typhoons (1960-72) are examined to determine the effect of Taiwan on the intensity and movement of tropical cyclones crossing the island. The results show an average intensity (maximum surface wind) decrease of over 40% and a distinct northward perturbation as the storms pass over the island. The effects of crossing Taiwan on tropical cyclones of different intensities are discussed. Forecast rules for typhoons approaching or crossing Taiwan are also presented. Author (GRA)

N74-16327# Stockholm Univ. (Sweden). Inst. of Meteorology.
RESEARCH ACTIVITIES OF THE INTERNATIONAL METEOROLOGICAL INSTITUTE Annual Report, Jul. 1972 - Jun. 1973
Aug. 1973 25 p
(AR-72) Avail: NTIS HC $3.25

The research work is organized in four sections: dynamic meteorology, atmospheric chemistry, atmospheric physics, and geophysical fluid mechanics; results of various studies are also presented. ESRO

N74-16328# Institut Royal Meteorologique de Belgique, Brussels.
SYNOPTIC OBSERVATIONS Monthly Bulletin, Jan. 1973 [OBSERVATIONS SYNOPTIQUES BULLETIN MENSUEL, JANVIER 1973]
Jan. 1973 31 p In FRENCH and DUTCH
Avail: NTIS HC $3.75

Synoptic measurements made at different Belgian weather stations in January 1973 are given. ESRO

N74-16329# Weapons Research Establishment, Adelaide (Australia).
COMPLETE LISTING OF UPDATED RESULTS FROM FALLING SPHERE EXPERIMENTS CONDUCTED IN AUSTRALIA MARCH 1962 TO JUNE 1972
P. H. O. Pearson and S. G. Johnson Jun. 1973 141 p refs
(WRE-TN-799) Avail: NTIS HC $9.25

A total of 70 successful experiments were conducted in Australia during the past ten years to measure basic atmospheric parameters by means of the falling sphere technique. Over the years, the method of data reduction and values of the sphere drag coefficient were revised and new procedures for updating previous results described. Using the latest methods of data reduction together with the latest drag coefficient matrix all previous falling sphere results were recalculated. A listing of all firings together with location, date and time of firing, and height range of atmospheric data is presented. Tables of density, temperature, and zonal and meridional wind values are included. ESRO

N74-16330# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL ORBSERVATIONS Monthly Bulletin, Oct. 1973 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, OCTOBRE 1973]
Oct. 1973 15 p In FRENCH and DUTCH
Avail: NTIS HC $3.00

Tabulated meteorological parameters observed at different Belgian weather stations during October 1973 are given. ESRO

N74-16331# Colorado Univ., Boulder. Inst. of Arctic and Alpine Research.
SHORT-TERM AIR-SEA INTERACTIONS AND SURFACE EFFECTS IN THE BAFFIN BAY DAVIS STRAIT REGION FROM SATELLITE OBSERVATIONS Final Report, Mar. 1971 - Oct. 1972
J. D. Jacobs, R. G. Barry, B. Stankov, and J. Williams Oct. 1972 82 p refs
(Grant NSF GU-28220)
(PB-223696/6GA; INSTAAR-OP-4-1972; Occasional-Paper-4) Avail: NTIS HC $6.25 CSCL 04B

A study of meteorological satellite data was undertaken for purposes of calculating surface energy budgets in relation to synoptic-term events in the Baffin Bay--Davis Strait region. Visual and infrared imagery, infrared temperature maps, satellite derived atmospheric temperature and humidity profiles, and conventional synoptic data were used to determine exchange rates for selected days in June, July, and August, 1970. An evaluation was made of presently available satellite data in comparison with surface and airborne measurements in the region. While problems remain in the satellite data interpretation and in the simplified energy budget model used, it is demonstrated that assessments of short-term (daily) variations in surface fluxes are possible using this approach. Author (GRA)

N74-16332# Bureau of Mines, Bartlesville, Okla. Energy Research Center.
ALDEHYDE AND REACTIVE ORGANIC EMISSIONS FROM MOTOR VEHICLES. PART 1: ADVANCED AUTOMOTIVE CONTROL SYSTEMS VEHICLES Final Report
Mar. 1973 92 p refs Sponsored by EPA
(PB-224251/9GA; APTD-1568A-Pt-1) Avail: NTIS HC $6.75 CSCL 13B

Aldehyde and reactive organic emissions as well as carbon monoxide and oxides of nitrogen emissions from automobiles equipped with various types of advanced prototype emission control systems including both catalytic and thermal reactor type systems were measured. The aim was to characterize aldehyde and reactive organic emissions from vehicles with prototype advanced emission control systems to provide data necessary to help determine if there is a need for aldehyde and/or reactive organic motor vehicle regulations, and to determine on a preliminary basis, the effect of ambient temperature on the emission characteristics of advanced emission control systems. (Modified author abstract) GRA

N74-16333# Bureau of Mines, Bartlesville, Okla. Energy Research Center.
ALDEHYDE AND REACTIVE ORGANIC EMISSIONS FROM MOTOR VEHICLES. PART 2: CHARACTERIZATION OF EMISSIONS FROM 1970 THROUGH 1973 MODEL VEHICLES Final Report
Mar. 1973 50 p refs Sponsored by EPA
(PB-224252/7GA; APTD-1568B-Pt-2) Avail: NTIS HC $4.50 CSCL 13B

Aldehyde and reactive organic emissions as well as carbon monoxide and oxides of nitrogen emissions were measured from 1970 through 1973 model vehicles. The aim was to characterize such emissions and to provide data to compare exhaust hydrocarbon reactivity for exhaust from 1970 through 1973 vehicles with that of exhaust from prototype low-emission systems. (Modified author abstract) GRA

N74-16334# Massachusetts Inst. of Tech., Cambridge. Energy Lab.

COST EVALUATION OF AIR POLLUTION CONTROL STANDARDS Final Report
Michael Frederick Ruane Feb. 1973 162 p refs
(Grant NSF GI-32874)
(PB-223980/4GA; MIT-EL-73-012) Avail: NTIS HC $4.75 CSCL 13B

A model is developed to describe the sulfur dioxide and particulate air pollution characteristics of a fossil fueled steam electric power plant. The model contains three stages. The first considers boiler emissions and the application of one of four parameterized abatement methods: wet limestone scrubbing, catalytic oxidation, magnesium oxide scrubbing, and the use of tall stacks. The second stage tests stack emissions and uses meteorological dispersion models, particularly the double Guassian model, to determine and test three hour, twenty-four hour and annual worst case ground level concentrations. The third stage calculates the performance of the abatement method used in terms of economics and resource costs. The model can be used to determine feasible combinations of plant types, site types and abatement methods as support for a separate generation expansion model. It can also be used independently to study environmental and economic sensitivities to changes in air pollution standards. (Modified author abstract) GRA

N74-16335# Minnesota Univ., St. Paul. Dept. of Soil Science.
A REPORT ON FIELD RESEARCH IN SOILS
D. G. Baker Mar. 1973 32 p refs
(Contract DI-14-31-0001-3901)
(PB-223909/3GA; OWRR-B-068-MINN(1); Soil-Ser-89) Avail: NTIS HC $3.75 CSCL 04B

The year 1972 shall long be remembered as one of the coldest years, a summer with many flash floods and a month without the sun. The year was the coldest since 1917; Minneapolis-St. Paul mean temperature in 1917 was 40.6 degrees and for 1972 - 41.3 degrees. Flash floods occurred in every month from May through September. The month of November received the least amount of sunshine of any month since sunshine records began. Yet the year can be classified as a quiet and peaceful year with respect to severe storms. There were only five tornadoes, compared with the normal of 17 per year, and all five were weak and caused little damage. Also there were less than the average number of damaging hail, wind and snow storms during the year. Author (GRA)

N74-16336# National Center for Atmospheric Research, Boulder, Colo.
PHOTOGRAPHY OF AIRBORNE ATMOSPHERIC HYDROMETEORS IN SITU FROM A SAILPLANE Final Report
Theodore W. Cannon 24 Sep. 1973 44 p refs
(Grant NSF C-760)
(PB-223767/5GA; NSF-73-64-C-760) Avail: NTIS HC $4.25 CSCL 04B

Ice particle shapes, sizes, and concentrations; raindrop sized and concentrations; and estimates of cloud droplet concentrations and maximum sizes are obtained from the photographs. The camera is capable of photographing transparent particles as small as about 1.5 micron radius; the size of the largest particle which would be completely imaged is limited by the 24 x 36 mm area photographed. Techniques are described for calibrating the camera so that both in-focus and out-of-focus images are used for determining concentrations and sizes. GRA

N74-16337# General Environments Corp., Springfield, Va.
A STUDY OF EMISSIONS FROM 1966-1972 LIGHT-DUTY VEHICLES IN WASHINGTON, D. C.
A. R. Martin and R. A. Herrick 7 Jul. 1973 105 p refs
(Contract EPA-68-01-0454)
(PB-224242/8GA; APTD-1506) Avail: NTIS HC $7.25 CSCL 13B

As part of the 1972 Emission Factors Program (Six Cities Program), one hundred and seventy privately owned passenger vehicles from the Metropolitan Washington, D.C. area were tested for exhaust emission levels of carbon monoxide, carbon dioxide, hydrocarbons and oxides of nitrogen according to the 1975 Federal Test Procedure. Testing of vehicles included both cold and hot start cycles. The test results were then used to calculate emission factors based on both the 1972 and 1975 Federal Test Procedures. (Modified author abstract) GRA

N74-16338# National Academy of Sciences - National Research Council, Washington, D.C. Committee on Atmospheric Sciences.
WEATHER AND CLIMATE MODIFICATION: PROBLEMS AND PROGRESS
Jun. 1973 275 p refs
(PB-224193/3GA; ISBN-0-309-02121-9) Avail: NTIS MF $1.45; Paper copy available from National Academy of Sciences, Washington, D. C. $6.50 CSCL 04B

The report not only emphasizes outstanding problems but also reviews recent work on the artificial modification of precipitation, the dissipation of fogs, and the modification of hailstorms, hurricanes, and other weather hazards. It also considers the important role of statistics in meeting requirements for better experimental designs and more relevant techniques for data analysis. In discussing national goals for the next decade the report proposes that research on precipitation modification be completed, technology required to mitigate severe storms be developed, and a program be established to determine the extent of inadvertent modification of local weather and global climate as a result of human activities. GRA

N74-16339# Hittman Associates, Inc., Columbia, Md.
ASSESSMENT OF SO2 CONTROL ALTERNATIVES AND IMPLEMENTATION PATTERNS FOR THE ELECTRIC UTILITY INDUSTRY
Mar. 1973 145 p refs
(Contract OST-40)
(PB-224119/8GA; HIT-550) Avail: NTIS HC $4.50 CSCL 13B

Four cases were investigated with the computer model developed by Hittman Associates to determine the nature of implementation plans for sulfur oxide control at the regional and national levels. In 1975 demand for low sulfur fuels will have exceeded the available supply. The four cases studied will achieve compliance with the state and Federal emission regulations by 1986 (one by 1983). All are based on the timely development of solvent refined coal and the availability and utilization of alternative stack gas cleaning and control processes. Control alternatives are summarized and discussed including nuclear power and other advanced energy conversion systems such as hydroelectric and geothermal. GRA

N74-16340# Battelle Columbus Labs., Ohio.
CLIMATOLOGICAL AND ENVIRONMENTAL FACTORS THAT INFLUENCE SURVIVAL ON THE GREAT LAKES Interim Report, 28 Nov. 1972 - 15 Jan. 1973
J. V. Baum, J. M. Tierney, and P. R. Sticksel 15 Jun. 1973 136 p refs
(Contract DOT-CG-23223-A)
(AD-768678; USCG-11-74) Avail: NTIS CSCL 04/2

The report presents a summary of weather and associated Great Lakes environmental conditions that are pertinent to survival. Selected average and extreme weather data are presented according to Lake regions. Some additional data are included on notable weather conditions and weather related casualties. Author (GRA)

N74-16341# Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie und Geophysik.
DAILY AND MONTHLY NORTHERN HEMISPHERE 5-MILLIBAR SYNOPTIC WEATHER MAPS OF JULY - SEPTEMBER 1968 Final Technical Report
Karin Labitzke 1973 129 p refs
(Contract DAJA37-71-C-0993)
(AD-768920) Avail: NTIS MF $1.45; HC available from Free Univ. of Berlin, West Germ. CSCL 04/2

The report contains a series of stratospheric weather maps for the 5-mb-level. Included are daily height and temperature analyses for three months for the Northern Hemisphere based on radiosonde and rocketsonde measurements and performed by using a hydrostatic build-up method. The corresponding monthly mean maps and their variations are included as well as the mean grid point data calculated from the daily values. The circulation pattern during the period under consideration is

described with special emphasis on the processes at high latitudes. Author (GRA)

N74-16342# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 11607 LANCE, MISSILE NO. 2164, ROUND NO. 190 RCT (27 JULY 1973)
Jul. 1973 31 p
(DA Proj. 1T6-65702-D-127)
(AD-769256; DR-787) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 11607 Lance, Missile Number 2164, Round Number 190 RCT, are presented in tabular form. Author (GRA)

N74-16343# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12809 LANCE, MISSILE NO. 2165, ROUND NO. 192 RCL (26 AUGUST 1973)
Aug. 1973 42 p
(DA Proj. 1T6-65702-D-127)
(AD-769257; DR-788) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12809 Lance, Missile Number 2165, Round Number 192 RCL, are presented in tabular form. Author (GRA)

N74-16344# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12809 LANCE, MISSILE NO. 2121, ROUND NO. 193 RCT (13 SEPTEMBER 1973) Meteorological Data Report
Sep. 1973 33 p
(DA Proj. 1T6-65702-D-127)
(AD-769258; DR-789) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12809 Lance, Missile Number 2121, Round Number 193 RCT, are presented in tabular form. Author (GRA)

N74-16345# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14801 LANCE, MISSILE NUMBERS 2195/2198, ROUND NOS. 194 APT/195 APT (26 SEPTEMBER 1973) Meteorological Data Report
Sep. 1973 41 p
(DA Proj. 1T6-65702-D-127)
(AD-769259; DR-790) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 14801 Lance, Missile Numbers 2195/2198, Round Numbers 194 APT/195 APT, are presented in tabular form. Author (GRA)

N74-16346# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12808 LANCE, MISSILE NO. 2500, ROUND NO. 196 APT (28 SEPTEMBER 1973) Meteorological Data Report
Sep. 1973 34 p
(DA Proj. 1T6-65702-D-127)
(AD-769260; DR-791) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12808 Lance, Missile Number 2500, Round Number 196 APT, are presented in tabular form. Author (GRA)

N74-16347# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14804 LANCE, MISSILE NUMBERS 2191/2187, ROUND NOS. 199 APT/200 APT Meteorological Data Report
Oct. 1973 47 p
(DA Proj. 1T6-65702-D-127)
(AD-769261; DR-794) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 14804 Lance, Missile Numbers 2191/2187, Round Numbers 199 APT/200 APT, are presented in tabular form. Author (GRA)

N74-16348# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14102 RIP, MISSILE NO. 10250, ROUND NO. 10 (15 AUGUST 1973)
Oct. 1973 19 p
(DA Proj. 1T6-65702-D-127)
(AD-769262; DR-795) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 14102 RIP, Missile Number 10250, Round Number 10, are presented in tabular form. Author (GRA)

N74-16349# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
UTAH LAUNCH COMPLEX, GREEN RIVER, UTAH. GREEN RIVER CLIMATE CALENDAR
John G. Luckau Feb. 1973 23 p
(DA Proj. 1T6-65702-D-127)
(AD-769249; DR-765) Avail: NTIS CSCL 04/2

Mean daily maximum and minimum temperatures, and extremes for the Utah Launch Complex, Green River, Utah, Green River met site SITE for the period of record (1963-1972) are presented in calendar form. Averages and extremes of temperature and wind are presented for each month, as well as average monthly relative humidity, cloud coverage, precipitation, and maximum 24-hour and monthly precipitation. Record extremes of station pressure are presented for each month, along with the date of record. Author (GRA)

N74-16350# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12001 LITTLE JOHN, MISSILE NO. 2412, ROUND NO. 700 RO (22 MAY 1973)
May 1973 28 p refs
(DA Proj. 1T6-65702-D-127)
(AD-769250; DR-780) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12001 Little John, Missile Number 2412, Round Number 700 RO, are presented in tabular form. Author (GRA)

N74-16351# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 15301 RAARE, MISSILE NO. 10021, ROUND NO. 1 (13 JUNE 1973) Meteorological Data Report
Jun. 1973 23 p
(DA Proj. 1T6-65702-D-127)
(AD-769251; DR-781) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 15301 RAARE, Missile Number 10021, Round Number 1, are presented in tabular form. Author (GRA)

N74-16352# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
ATHENA H-011, FLIGHT 141 (24 AUGUST 1973) Meteorological Data Report
Len E. Carter Aug. 1973 70 p
(DA Proj. 1T6-65702-D-127)
(AD-769255; DR-786) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of Athena Flight 141, Vehicle H-011, are presented for the Air Force Space and Missile Systems Organization and for ballistic studies. The data are presented in tabular and figure form. Author (GRA)

N74-16353# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 11602 LANCE, MISSILE NO. 2356, ROUND NO. 91 RST (22 AUGUST 1973) Meteorological Data Report
Aug. 1973 41 p
(DA Proj. 1T6-65701-D-127)
(AD-769254; DR-785) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 11602 Lance, Missile Number 2356, Round Number 191 RST, are presented in tabular form. Author (GRA)

N74-16354# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 11602 LANCE, MISSILE NO. 2426, ROUND NO. 189 RSL (22 JUNE 1973) Meteorological Data Report
Jun. 1973 39 p
(DA Proj. 1T6-65702-D-127)
(AD-769253; DR-783) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 11602 Lance, Missile Number 2426, Round Number 189 RSL, are presented in tabular form. Author (GRA)

N74-16355# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 11604 LANCE, MISSILE NO. 2169, ROUND NO. 188 RCT (21 JUNE 1973) Meteorological Data Report
Jun. 1973 41 p
(DA Proj. 1T6-65702-D-127)
(AD-769252; DR-782) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 11604 Lance, Missile Number 2169, Round Number 188 RCT, are presented in tabular form. Author (GRA)

N74-16356# Naval Weather Service Environmental Detachment, Asheville, N.C.
NORTHEAST ATLANTIC ENVIRONMENTAL SCENARIO
Nov. 1973 179 p
(AD-769271) Avail: NTIS CSCL 04/2

The publication presents a broad climatic survey of five areas in the Northeastern Atlantic Ocean. Over 40 different presentations have been devised to describe the major features of the climate. Most of the charts and graphs depict percentage frequency of occurrence of observations recording phenomena of particular operational significance. Topics discussed include the following: Ceiling; cloudiness; fog; precipitation; storms; superstructure icing; surface currents; temperature, humidity; visibility; waves; wind; and, ice. GRA

N74-16357# Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.
OCEANIC THERMAL RESPONSE TO A TIME-DEPENDENT HURRICANE MODEL M.S. Thesis
Thomas Stewart Fraim Sep. 1973 71 p refs
(AD-769414) Avail: NTIS CSCL 04/2

A layer-ocean model was developed based on the mixed layer models of Kraus and Turner (1967) and Denman (1972). The ocean model was coupled to Pearson's (1972) time varying, symmetrical-stationary hurricane model which was based on a model proposed by Riehl (1963), and in which the air-sea interaction was specified by Cardone's (1969) extension of Blackadar's (1965) two-layer, baroclinic boundary-layer model. Time-dependent solutions for ocean mixed layer depth and temperature were obtained in response to interaction with the atmospheric model. Solutions indicated that the interaction between entrainment mixing and upwelling was most important in changing mixed-layer depth and temperature. (Modified author abstract) GRA

N74-16358# Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.
TESTS OF A RADIATIVE TRANSFER MODEL FOR NUMERICAL PREDICTION OF THE ATMOSPHERIC GENERAL CIRCULATION M.S. Thesis
Robert John Plante Mar. 1973 117 p refs
(AD-769425) Avail: NTIS CSCL 04/2

An evaluation is performed of a radiation model for the Naval Postgraduate School primitive-equation numerical weather prediction system. The model employs empirical expressions for atmospheric absorptivity, scattering-reflectivity, cloud-reflectivity and earth-surface reflectivity to compute solar insolation absorbed at earth and in the key atmospheric layers. The terrestrial cooling effect at earth and in these same key atmospheric layers is formulated using recent empirically-derived emissivities for the effects of both water vapor and CO2. Mean seasonal atmospheric soundings for the Northern Hemisphere are used for testing the model. Heat budgets are compiled for the earth-atmosphere system, the atmospheric column and the earth's surface. GRA

N74-16359# Naval Postgraduate School, Monterey, Calif. Dept. of Meteorology.
AN ANALYSIS OF THE THERMAL AND CIRCULATION FEATURES OF EASTERN NORTH PACIFIC CYCLONES USING AIRCRAFT RECONNAISSANCE DATA M.S. Thesis
Thomas George Upton Sep. 1973 54 p refs
(AD-769430) Avail: NTIS CSCL 04/2

Over 225 aircraft reconnaissance missions (1966-1972) into eastern North Pacific tropical (EASTROPAC) cyclones (tropical storms and hurricanes only) are computer processed and analyzed to present a composite view of the near-center cyclone structure. Radially-averaged profiles of D-values, isotherms, and isotachs are related to similar information from North Atlantic and western North Pacific tropical cyclones. The analyses qualitatively indicate that EASTROPAC cyclones are small in horizontal extent while relatively intense for their size, the latter feature comparing favorably to the average North Atlantic tropical cyclone. Maximum warming occurs within the radius of maximum wind (which averages 24 n mi) at lower levels with cyclone-induced warming evident to a radius of 90 n mi at upper levels. Other features are shown and suggestions for future research are discussed. (Modified author abstract) GRA

N74-16360# Naval Academy, Annapolis, Md.
THE MECHANISM OF TORNADO FORMATION
K. T. Repsholdt 21 May 1973 82 p refs
(AD-769512; USNA-TSPR-48) Avail: NTIS CSCL 04/2

The mechanism (phases) of a developing tornado was investigated in this study on a laboratory model. Three existing theories for the mechanism of tornado formation were studied and discussed in length. From the information gained in this study an experimental facility was designed and constructed to approximate the fluid flow environment of the tornado. Vortices formed in this facility are considered similar to actual weak strength tornados. The mechanism for the formation of these vortices was deduced, using flow visualization techniques. GRA

N74-16361# Naval Postgraduate School, Monterey, Calif.
PARAMETERIZATION OF THE MIXING RATIO VERTICAL DISTRIBUTION BY A POWER-LAW PROFILE M.S. Thesis
William Haskew Maxwell Sep. 1973 72 p refs
(AD-769761) Avail: NTIS CSCL 04/2

An investigation is made into the accuracy of the description of the actual mixing-ratio profile by a power-law approximation. The approximation is obtained by a least-squares technique in order to derive the best-fit exponent lambda of the pressure profile. The lambda-values were computed for soundings at 12 geographically diverse stations over the United States during the period 16-23 March, 1971. The lambda-values at each station were found to undergo a time-variation based mainly on the synoptic-scale variations in the mixing-ratio profiles. A stepwise multiple regression procedure involving up to four variables from the temperature-humidity soundings was used in order to predict the value of lambda from gross-parameters of the soundings by station. Tests were performed at four stations in comparing the observed precipitable water vapor (W sub 0) with that computed from the power-profile (W sub cs) which depended upon lambda computed from the sounding. (Modified author abstract) GRA

N74-16362# Naval Postgraduate School, Monterey, Calif.
THE EFFECT OF A CISK (CONDITIONAL INSTABILITY OF THE SECOND KIND) PARAMETERIZATION UPON A TROPICAL WAVE GROWTH M.S. Thesis
Thomas Michael Piwowar Sep. 1973 64 p refs
(AD-769687) Avail: NTIS CSCL 04/2

The linear boundary layer solution (Chang, 1973b), which includes the temporal acceleration, is used for a CISK (Conditional Instability of the Second Kind) parameterization to study tropical lower tropospheric waves. A one-level equation is derived for the top of the boundary layer and is solved numerically for its eigenvalues. Calculations are made for varying boundary-layer depths and vertical heating gradients. Growth rates, periods and eigenfunctions for the lowest meridional modes of synoptic-scale disturbances are analyzed. Results indicate that CISK heating does not prefer any finite wavelength. Author (GRA)

N74-16363# Naval Postgraduate School, Monterey, Calif.
SYNOPTIC INVESTIGATION OF EAST COAST BACK-DOOR COLD FRONTS M.S. Thesis
Gordon Allen Bellemer Dec. 1973 61 p refs
(AD-769748) Avail: NTIS CSCL 04/2

Results are presented from a synoptic study of back-door cold fronts along the east coast of the United States in the years 1963 to 1972. The investigation sets forth the climatology of back-door cold fronts with respect to: (1) frequency, (2) six hourly speed of movement, and (3) southern penetration. The individuality of fronts is treated with respect to: (1) temperature and dew-point changes, (2) pressure tendencies, (3) windshifts,

(4) precipitation, (5) vertical extent, and (6) surface/500-mb relationships. Findings include: (1) highest frequency of occurrence is late spring and early fall, (2) speed of movement is greatest in nighttime hours and in spring and fall, (3) deep southern penetration is most likely to occur in June, (4) precipitation is more associated with a 500-mb short-wave trough and position and/or motion of the surface front, (5) fronts continue southward penetration until parallel to 500-mb flow and (6) southernmost penetration of fronts is coincident with movement of the high center behind (i.e., north of) the front eastward off the coast. A detailed discussion of the 2 April 1963 case is presented. Author (GRA)

N74-16364# Army Electronics Command, Fort Monmouth, N.J.
ALGORITHMS FOR GENERATING A SKEW-T, LOG P DIAGRAM AND COMPUTING SELECTED METEOROLOGICAL QUANTITIES
G. S. Stipanuk Oct. 1973 40 p refs
(DA Proj. 1T0-61102-B-53A)
(AD-769739; ECOM-5515) Avail: NTIS CSCL 04/2

The paper discusses numerical methods of computing meteorological quantities which are usually manually derived from analysis on a SKEW-T log p diagram. The numerical methods used were selected for their simplicity and accuracy. A mathematical characterization of the SKEW-T and algorithms for computing several meteorological quantities are presented. Author (GRA)

N74-16365# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14102 RIP, MISSILE NO. 10232, ROUND NO. 9 Meteorological Data Report
Oct. 1973 16 p
(DA Proj. 1T6-65702-D-127)
(AD-769609; DR-793) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 14102 RIP, Missile Number 10232, Round Number 9, are presented in tabular form. Author (GRA)

N74-16366# Army Electronics Command, Fort Monmouth, N.J.
THE HYDROMETEOROLOGIC GROUND TRUTH FACILITY AT WHITE SANDS MISSILE RANGE, NEW MEXICO
William J. Stone Oct. 1973 40 p refs
(DA Proj. 1T0-61102-B-53A)
(AD-769629; ECOM-5513) Avail: NTIS CSCL 04/2

In preparation for the launch of a geosynchronous meteorologic satellite, SMS/GOES-A, several ground truth facilities are being established at White Sands Missile Range, New Mexico. One of these facilities, consisting of two instrumented watersheds on the western piedmont slope of the San Andres Mountains, Dona Ana County, New Mexico, will provide basic hydrometeorologic data. Instruments used include: eight recording rain gages, nine nonrecording rain gages, five recording, flood stage stream gages, five self-siphoning sediment samplers, one recording water well monitor, and three evaporation stations. All equipment, except that for the evaporation stations, is provided, operated, and maintained under contract by the U.S. Geological Survey, Albuquerque. Data provided by these instruments will be used to study the hydrometeorologic controls of soil trafficability and to investigate the possibility of predicting trafficability from hydrometeorologic conditions. Author (GRA)

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N74-16367*# Linguistic Systems, Inc., Cambridge, Mass.
ULTIMATE PERFORMANCE OF THE FIXED-BEACON POSITION-FINDING SYSTEM
G. B. Rachet and J. L. Pieplu Washington NASA Feb. 1974 17 p refs Transl. into ENGLISH of "EOLE: Performances Ultimes du Systeme de Localisation de Balises Fixes", Centre Spatial de Bretigny, Div. Math. and Traitment, Dept. Calcul d'Orbites, France, report GB/73.364/CB/MT/OB
(Contract NASw-2482)
(NASA-TT-F-15285; GB/73.364/CB/MT/OB) Avail: NTIS HC $3.00 CSCL 17G

The results obtained for analyzing the ultimate performance of the Eole position-finding system for fixed beacons are presented in synthesis. With the use of up-to-date equipment (Baker Nunn cameras) and sophisticated programming, this performance was shown to be 250 meters for distance measurements and 10 centimeters per second for Doppler measurements. After correction of distance skews the position-finding accuracy is 100 to 150 meters for position-finding skew and 250 to 300 meters for the dispersion sigma with respect to this skew. Author

N74-16368# European Space Research and Technology Center, Noordwijk (Netherlands).
SURVEILLANCE ACCURACY IN THE AEROSAT SYSTEM
P. Norris Paris ESRO Jun. 1973 51 p refs
(ESRO-TN-87-ESTEC) Avail: NTIS HC $4.75

An aeronautical satellite system providing two range measurements and two range rate measurements was studied. The accuracy with which a system user (e.g. an aircraft) can have its position and velocity determined was examined. Error sources contributing to a reduction of this accuracy are listed. Particular attention was paid to errors in the user-reported altitude and in the orbit determination satellites. Graphs are provided to show the attainable accuracy as a function of the range measurement and of the user-reported altitude accuracy. Author (ESRO)

N74-16369# European Space Research and Technology Center, Noordwijk (Netherlands).
APPLICATION OF KALMAN FILTERING TO THE ATTITUDE DETERMINATION OF SPIN-STABILIZED SATELLITES [APPLICATION DU FILTRAGE DE KALMAN A LA DETERMINATION D'ATTITUDE DES SATELLITES STABILISES PAR ROTATION]
J. Soubirou 1973 19 p refs In FRENCH; ENGLISH summary Presented at the 4emes Journees d'Optique Spatiale, Marseille, 6-8 Nov. 1973
Avail: NTIS HC $3.00

The application of Kalman filtering to the problem of determining the attitude of spin-stabilized satellites is discussed. The technique is illustrated by application to the ESRO 4 horizon crossing indicator (HCI) data. It is shown that, in addition to the reconstitution of the ESRO 4 attitude, Kalman filtering applied to the ESRO 4 HCI in-orbit data permits the estimation of HCI triggerring delays and the misalignment between the maximum inertia axis and the longitudinal geometric axis. Author (ESRO)

N74-16370# European Space Research and Technology Center, Noordwijk (Netherlands).
COMBINED SUN/EARTH ALBEDO SENSOR FOR COS-B
B. Morgenstern 1973 13 p refs Presented at the 4emes Journees d'Optique Spatiale, Marseille, 6-8 Nov. 1973
Avail: NTIS HC $3.00

The attitude sensor to be flown onboard the COS-B satellite is a modified version of the HEOS albedo sensor. It consists of a pair of fan beam sensors in V configuration, each unit having a field of view of nominally 1 x 120 deg. By means of two trigger level electronics, this sensor, which responds to visible and infrared radiation, detects the angular position of the earth horizon and the sun; from this the earth and sun position are derived. ESRO

N74-16371# Air Force Academy, Colo. Frank J. Seiler Research Lab.
SEISMOMETER COMPENSATION FOR BROADBAND, LOW-LEVEL ACCELERATION MEASUREMENTS Interim Report
Bill J. Simmons Sep. 1973 11 p refs Presented at AIAA Guidance and Control Conf., Key Biscayne, Fla., 20-22 Aug. 1973
(AF Proj. 7904)
(AD-769289; SRL-TR-73-0012; Paper-73-828) Avail: NTIS CSCL 17/7

Precise measurements of geokinetic disturbances are required for the monitor and control of inertial instrument test platforms.

Low-cost, compact seismometers were compensated to obtain representative performance. Using random-noise excitation of a bridge circuit, damping and electrical compensation values were determined which extend the useful bandwidth almost two decades below the seismometer natural frequency. Use of paired sensor and isolated-signal grounds enhance the signal-to-noise ratio. The resultant high-gain, low-noise circuit is described with particular attention to the shielding and grounding scheme, and general compensation applications. Frequency responses are shown for the seismometer and compensation networks.
Author (GRA)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N74-16372*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIGITAL COMPUTER STUDY OF NUCLEAR REACTOR THERMAL TRANSIENTS DURING STARTUP OF 60-kWe BRAYTON POWER CONVERSION SYSTEM
Kent S. Jefferies and Roy C. Tew Washington Feb. 1974 21 p refs
(NASA-TM-X-2984; E-7646) Avail: NTIS HC $2.75 CSCL 18I

A digital computer study was made of reactor thermal transients during startup of the Brayton power conversion loop of a 60-kWe reactor Brayton power system. A startup procedure requiring the least Brayton system complication was tried first; this procedure caused violations of design limits on key reactor variables. Several modifications of this procedure were then found which caused no design limit violations. These modifications involved: (1) using a slower rate of increase in gas flow; (2) increasing the initial reactor power level to make the reactor respond faster; and (3) appropriate reactor control drum manipulation during the startup transient. Author

N74-16373# Naval Research Lab., Washington, D.C.
IRRADIATION EFFECTS ON REACTOR STRUCTURAL MATERIALS Quarterly Progress Report, 1 May - 31 Jul. 1973
L. E. Steele 15 Aug. 1973 51 p refs
(Contract AT(49-5)-2110)
(AD-768290; NRL-MR-2639) Avail: NTIS CSCL 18/10

The report, covering research for the period 1 May - 31 July 1973, includes: (1) fatigue properties of irradiated EBR-2 control rod thimble (304 stainless steel); (2) fracture toughness characterization of irradiated stainless steels; (3) notch ductility of higher strength steels. Types A543 plate and A508 forging; (4) damage produced in iron and iron alloys by neutron irradiation and ion bombardment; (5) mircrostructure of helium-implanted annealed and cold worked 316 stainless steel, and (6) determination of neutron flux level in the SM-1 reactor. (Modified author abstract) GRA

N74-16374# Naval Research Lab., Washington, D.C.
GENERALIZED PROCEDURES FOR THE USE OF PLANE STRAIN AND ELASTIC-PLASTIC FRACTURE MECHANICS OPTIONS IN THE MODERNIZATION OF NUCLEAR STANDARDS Final Report
F. J. Loss, J. R. Hawthorne, and W. S. Pellini 18 Sep. 1973 27 p refs
(Contract AT(49-5)-2110; RR0221141)
(AD-769217; NRL-7603) Avail: NTIS CSCL 18/5

In the design of nuclear power plants and the selection of required structural materials, the assurance of reliability in operation is an essential consideration. The need for analytical criteria for defining the adequacy of fracture toughness specifications is particularly acute for pressure vessel materials. In the modernization of nuclear codes, there is additional need to include the full range of fracture mechanics options for system design, that is, to include elastic-plastic and fully plastic fracture mechanics, as well as the linear-elastic procedures. This report describes recent developments in the means for defining the full range of plane strain, elastic-plastic, and plastic fracture mechanics options available to the designer. Comparisons are made between these options and the fracture toughness requirements of the ASME Nuclear Code (Section III). Existing dynamic plane strain data for structural metals are analyzed in concert with dynamic tear test trends. GRA

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N74-16375 Purdue Univ., Lafayette, Ind.
A BRILLOUIN SCATTERING STUDY OF MAGNETOACOUSTOELECTRIC DOMAINS IN n-GaAs Ph.D. Thesis
Thomas Edward Parker 1973 181 p
Avail: Univ. Microfilms Order No. 73-28123

The evolution of acoustoelectric domains in the presence of a transverse magnetic field has been studied by using the Brillouin scattering technique. The discussion is divided into three major areas:(1) effect of a transverse magnetic field on the acoustic flux growth in the weak flux regime;(2) a quantitative study of the mixing of acoustic waves (parametric conversion) in strong flux; and (3) effects of a transverse magnetic field on the mixing of acoustic waves and on the flux dependence of the acoustoelectric gain in strong flux. Dissert. Abstr.

N74-16376 Oregon Univ., Portland.
CONSERVATION LAWS AND MACH'S PRINCIPLE IN BI-METRIC RELATIVITY Ph.D. Thesis
Peter Julian Adams 1973 129 p
Avail: Univ. Microfilms Order No. 73-28573

Integral conservation laws for energy, momentum, and angular momentum in general relativity have been a subject for controversy. Some of these conservation laws are analyzed using a Lagrangian and covariant Noether theorem formulation in terms of the killing symmetries admitted by an underlying spacetime geometry. It is demonstrated that the total energy, total momentum, and total angular momentum of a gravitating physical system are explicitly related to the killing symmetries of an underlying spacetime in a generally covariant manner. The underlying spacetime is introduced into gravitational theory through use of bi-metric relativity, which can be formulated in such a manner that the physical consequences of general relativity are left unchanged. Two continuity equations for energy, momentum, and angular momentum are generated by the covariant Noether theorem from two covariant Lagrangians, the bi-metric Einstein Lagrangian and square root of minus g R.
Dissert. Abstr.

N74-16377 Stanford Univ., Calif.
ACOUSTIC SCATTERING FROM AN AIRCRAFT TRAILING VORTEX Ph.D. Thesis
Vernon Wayne Ramsey 1973 257 p
Avail: Univ. Microfilms Order No. 73-30463

Acoustic scattering from the velocity field of an aircraft trailing vortex is considered. Although the primary effort is devoted to scattering from the turbulence field, some new results are also presented for scattering from the mean flow component. The turbulence scattering analysis utilizes in combination the local homogeneity and eddy convection theories developed by R. A. Silverman. An interesting point demonstrated by the vortex scattering application is that these local homogeneity and convection models exist more naturally in combination than as isolated techniques. The analysis method thus formulated is especially well adapted to acoustic scattering from turbulent flows in which significant variations of mean flow and turbulence level occur over distances which are not large in comparison to the macroeddy size. Dissert. Abstr.

N74-16378 Iowa Univ., Iowa City.
MAGNETIC SUSCEPTIBILITY STUDY OF ALPHA-PHASE

Cu-Al AND DILUTE MAGNETIC Cu-AL(Fe) ALLOYS Ph.D. Thesis
Francis Bernard Huck 1973 282 p
Avail: Univ. Microfilms Order No. 73-30930

The magnetic susceptibilities of a series of alpha-phase Cu(1-x)Alx and dilute magnetic Cu(1-x)Alx(Fe) alloys with iron concentrations near 0.08 at. % have been measured over the temperature range from 1.5 - 300 K and at six magnetic fields in the range from 4 - 13 kG. The alloys had Al concentrations of 0, 2.5, 5, and 10 at.%. The results of measurements on the Fe-free specimens were in good agreement with the published data of other investigators. Dissert. Abstr.

N74-16379# National Bureau of Standards, Washington, D.C. Applied Acoustics Div.
STANDARDS OF NOISE MEASUREMENTS, RATING SCHEMES, AND DEFINITIONS: A COMPILATION
Jack M. Fath Nov. 1973 91 p refs
(NBS-SP-386) Avail: SOD HC $1.10 as C13.10:386

The compilation deals with material assembled from the various standards, industrial and trade organizations, or technical and scientific societies concerned with acoustics. There was no attempt to review or evaluate the standards, but rather just to list those that are available. The standards cover a broad scope of topics in acoustics--including measurement techniques, rating schemes, definitions, equipment and product specification, subjective measurements and response to noise, and calibration methods. Those standards dealing solely with shock and vibration were not generally included. A brief summary of intent and/or scope of the standard is given. In some cases the paragraph is the official description of the standard as issued by the organization or society promulgating the standard, while in others the paragraph merely describes the spirit of the standard. Proposed standards are also listed. The compilation includes all information available as of April 1, 1973. Author

N74-16380*# IIT Research Inst., Chicago, Ill.
APPLICATION OF CROSSED BEAM TECHNOLOGY TO DIRECT MEASUREMENTS OF SOUND SOURCES IN TURBULENT JETS, PART 1 Final Report
L. N. Wilson 26 Feb. 1970 58 p refs
(Contract NAS8-21035)
(NASA-CR-129018; J6112-Pt-1) Avail: NTIS HC $5.00 CSCL 20A

The mathematical bases for the direct measurement of sound source intensities in turbulent jets using the crossed-beam technique are discussed in detail. It is found that the problems associated with such measurements lie in three main areas: (1) measurement of the correct flow covariance, (2) accounting for retarded time effects in the measurements, and (3) transformation of measurements to a moving frame of reference. The determination of the particular conditions under which these problems can be circumvented is the main goal of the study. Author

N74-16381# Technische Univ., Berlin (West Germany).
THE TREATMENT OF THE SELF-EXCITED RELAXATION VIBRATION IN THE STROKED STRING WITH THE HELP OF THE FINITE LAPLACE TRANSFORMATION Ph.D. Thesis [DIE BEHANDLUNG DER SELBSTERREGTEN KIPPSCHWINGUNGEN DER GESTRICHENEN SAITE MIT HILFE DER ENDLICHEN LAPLACETRANSFORMATION]
Hans Lazarus 1972 157 p refs In GERMAN
Avail: NTIS HC $10.00

Self induced vibrations during tapering off of holding and gliding phases in agitated strings are analyzed by representing the continuous string in discrete elements and by using the finite Laplace transformation in differential equations to calculate vibratory relaxation. A connection between minimal bow pressure and expectable loss is also discussed. Transl. by G.G.

N74-16382# Technische Univ., Berlin (West Germany). Fachbereich 4 (Physik).
ANALYSIS AND OPTIMIZATION OF OPTICAL SYSTEMS Ph.D. Thesis [ZUR ANALYSE UND OPTIMIERUNG OPTISCHER SYSTEME]
Hans-Joachim Schulz 1972 102 p refs In GERMAN
Avail: NTIS HC $7.25

Evaluation of the gauss moment in the cross aberration and quantitative determination of the hit-diagram method is used to optimize photo objectives via chromatic corrections. Interpolating power series calculations on waveforms produce Twyman interferograms for the differentiation of theoretical residual error from production caused error in the object. Transl. by G.G.

N74-16383# J. G. Engineering Research Associates, Baltimore, Md.
A SIMPLIFIED REPRESENTATION OF CYLINDRICAL SHELL RADIATION UNDER CONCENTRATION FORCES
Joshua E. Greenspon Mar. 1973 25 p refs
(Contract N00014-71-C-0115)
(AD-768922; Rept-0-73-1) Avail: NTIS CSCL 20/1

The report presents the relationships for random noise radiated by concentrated forces exciting a shell. The mathematical model of the infinitely long stiffened cylindrical shell is employed to compute the radiation patterns for point forces exciting the shell. The behavior is traced from very low to very high frequencies. The shell acts as a dipole at low frequency. As the frequency is increased higher lobes enter the picture until finally at very high frequency the rabbit ear behavior predicted for plates is predominant. Author (GRA)

N74-16384# Harry Diamond Labs., Washington, D.C.
GUN-DRIVEN FLUX COMPRESSION
Michael J. Vrabel and Richard P. Leavitt May 1973 19 p refs
(HDL Proj. ILR89; DA Proj. 1T0-61101-A-91A)
(AD-768095; HDL-TR-1632) Avail: NTIS CSCL 20/3

A projectile accelerated to a velocity of 1 mm/microsec by a helium-driven gun was used to generate a magnetic field of 1.3 MG, using the technique of flux compression. The design of the flux-compression device was optimized with the aid of a simplified theory. This theory was used to investigate the relationship of maximum field to coil geometry, seed field, and projectile velocity. Author (GRA)

N74-16385# Stanford Univ., Calif. Microwave Lab.
MICROWAVE RESEARCH Annual Status Report, 1 Jun. 1972 - 31 May 1973
Oct. 1973 146 p refs
(Contract N00014-67-A-0112-0039; NR Proj. 373-361)
(AD-768895; SU-ML-2170; ASR-6) Avail: NTIS CSCL 20/1

Contents: Acoustic pumping of fluids; Fuel cell research; Signal processing with acoustic surface waves; Acoustic waves on nonpiezoelectric materials; Acoustic methods for cell discrimination; Signal transformation with recirculating delay lines; Electronic scanning and focusing of acoustic beams; Acoustic tactile sensing; Rotation sensing with acoustic waves; Acoustic waveguide theory; Acoustic absorption spectra of biological materials. GRA

N74-16386# Army Missile Command, Redstone Arsenal, Ala.
COHERENT OPTICAL TESTING METHODS FOR MIRRORS
B. D. Guenther and C. C. Aleksoff 1 May 1973 36 p refs
(DA Proj. 1T0-61102-B-23A)
(AD-769598; RR-73-4) Avail: NTIS CSCL 20/6

Several methods of optical component testing are reviewed. These methods are then demonstrated by evaluating several mirrors designed to be used in a high energy CO2 laser system. The methods described were selected because they can be easily used to make a rapid evaluation of optical components. Author (GRA)

N74-16387# Army Missile Command, Redstone Arsenal, Ala.
COMPUTER AIDED OPTICAL LENS DESIGN AND IMAGE ANALYSIS
William D. Hyman and George L. Marshall, Jr. 20 Aug. 1973 61 p
(DA Proj. 1X5-23627-D-306)
(AD-769594; RE-73-34) Avail: NTIS CSCL 20/6

At the core of the U.S. Army Missile Command's (MICOM's) capability to design and analyze optical system performance is a computer program written for the National Aeronautics and Space Administration (NASA) called FORTRAN Optical Lens Design Program (FOLDP). Personnel at MICOM have modified this program to use the available SC 4020 digital computer plotter and developed a program to do a complete analysis of

the image produced by the finished design. The modifications required on the basic program are discussed and a complete description of the Image Analysis Program and user guidelines are presented. The Image Analysis Program can be used in conjunction with any raytrace program which yields ray coordinates and direction cosines on the final optical surface as its end product. Author (GRA)

N74-16388# White Sands Missile Range, N.Mex. Optics Branch.
DISCUSSION OF PROPOSED CONTRAVES F DYNAMIC TESTS
Richard Warnis May 1973 100 p refs
(AD-769621; TM-73-1) Avail: NTIS CSCL 20/6

The report presents a mathematical analysis of the proposed instrumental dynamic pointing accuracy tests of the Contraves F Cinetheodolite. Also, the report discusses other important aspects of these tests. Author (GRA)

N74-16389# Miami Univ., Fla. Inst. of Marine and Atmospheric Sciences.
LONG RANGE ACOUSTIC PROPAGATION PROJECT. BLAKE TEST SYNOPSIS REPORT
Scott C. Daubin and John P. Nardello (Hydrospace-Challenger, Inc.) 1973 44 p
(Contract N00014-67-A-0201-0024; NR Proj. 092-117)
(AD-768995) Avail: NTIS CSCL 08/10

The ACODAC exercise known as the BLAKE TEST was an outgrowth of the LRAPP environmental acoustics operation in the Caribbean during the fall of 1972. This exercise raised some questions regarding the self noise of ACODAC systems and the overall performance of the hydrophone array which had broken free and from which no usable data were recovered. The BLAKE TEST also served as a training precursor for the extensive series of ACODAC deployments scheduled for the Pacific in 1973 from R/V NORTH SEAL. GRA

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N74-16390 National Bureau of Standards, Washington, D.C. Inst. of Basic Standards.
BIBLIOGRAPHY ON ATOMIC TRANSITION PROBABILITIES, JULY 1971 THROUGH JUNE 1973
J. R. Fuhr and W. L. Wiese Nov. 1973 63 p refs
(NBS-SP-320-Suppl-2) Avail: SOD HC $0.95 as C13.10:320 Suppl. 2

The second supplement to the NBS special publication 320, Bibliography on Atomic Transition Probabilities is presented. It covers the most recent literature on the subject from July 1971 through June 1973. The papers are arranged according to elements and stages of ionization, and the method employed and classification of transitions are indicated for each reference. Only articles on discrete transitions, both allowed and forbidden, are listed. Papers containing data for many elements within isoelectronic sequences are collected separately in front of the list in order to keep this bibliography to a reasonable size. Also included is a selected list of new papers dealing with the subject of atomic transition probabilities from a general point of view. Author

N74-16391 American Univ., Washington, D.C.
ION-ION POTENTIALS IN LIQUID METALS Ph.D. Thesis
David John Edwards, III 1973 151 p
Avail: Univ. Microfilms Order No. 73-28812

The optimized model potential developed by Shaw is used to calculate the effective interaction between ions for seven simple liquid metals (Li, Na, K, Al, Mg, In, Cd). Shaw's approximation for electron exchange and correlation corrections is included in the calculation for all seven metals. The approximations for electron exchange and correlation effects proposed by Singwi et al and Geldart and Taylor have been included for Na, Al, and In for comparison. The entropy and specific heat at constant volume were calculated for all the metals, including all three approximations for many-electron effects, using the ion-ion potential and the variational formulation of the perturbation theory of liquids. The results are compared with experimental data and discussed. Dissert. Abstr.

N74-16392# Technical Research Centre of Finland, Helsinki. Reactor Lab.
ON THE EXCITATION OF CHARACTERISTIC TiK, NbK, AND AuM X-RAYS BY 0,7...2,5 MeV PROTON BOMBARDMENT
Aro Fahlenius 1973 15 p refs
(Pulb-3) Avail: NTIS HC $3.00

The small signal impurity analysis of recently published measurements on proton excited X-ray spectra is continued. From the low intensity X-ray yields of new target backing foil impurities absolute cross sections for TiK and NbK sub alpha inner shell vacancies were evaluated. Further, absolute ionization cross sections for AuM sub alpha, beta and AuM sub gamma shells were determined. The 2,1 MeV upper limit of bombarding energy for titanium and gold was determined by an increased continuous background in the aluminum backing foil. The estimated maximum experimental errors were about 26...31 % for the K-shells and 22...30 % for the M-shell; in the latter case the large uncertainty of M-shell fluorescence yields due to insufficient knowledge is not considered. The experimental results were compared with ordinary K-shell binary encounter models and with an M-shell modification of Singh's L-shell estimate. The measured AuM-subshell ionization cross section ratios remained constant with increased energy from 0,7 to 2,1 MeV. These observed low level impurities permitted estimations of X-ray sensitivity limits of 0,7...0,9 ng in the aluminum matrix studied. Author

N74-16393# Technische Univ., Berlin (West Germany).
STUDY ON THE SIMPLE- AND DOUBLE-PLASMON EXCITATION IN ALUMINUM BY SLOW ELECTRONS Ph.D. Thesis [UNTERSUCHUNG DER EINFACH- UND DOPPELPLASMONANREGUNG IN ALUMINIUM DURCH LANGSAME ELEKTRONEN]
Alexander Imbusch 1972 63 p refs In GERMAN
Avail: NTIS HC $5.25

Electron mean free path length measurements for single plasmon excitation in aluminum confirm Quinn's theory on slow electron path length. Direct double excitation of two plasmons by scattering electrons is studied by plasma analysis considering plasmon interaction effects and 2nd order perturbation theory. Transl. by G.G.

N74-16394# Technische Univ., Berlin (West Germany).
ELECTRON AND PHOTOEMISSION OF FRICTION STRESSED ALUMINUM Ph.D. Thesis [ZUR EXOELEKTRONEN- UND PHOTOEMISSION VON REIBBEANSPRUCHTEN ALUMINIUM]
Adolf Scheibe 1972 110 p refs In GERMAN
Avail: NTIS HC $7.50

The effects of gliding friction path and friction load on optical electron emission from aluminum surfaces is studied for the temperature region - 190 C to + or - 375 C. Analysis of glow emission curves proves the combined effect of optical stimulated electron emission and photoemission. It is assumed that lattice defects of different activation energies are responsible for the glow emission effect. Transl. by G.G.

N74-16395# Technische Univ., Berlin (West Germany).
SPIN-ORBIT EXCHANGE EFFECT AND OCTAHEDRIC LIGAND FIELD SPLITTING OF A DIMENSIONAL LIMITED ONE-ELECTRON SYSTEM Ph.D. Thesis [SPIN - BAHN - WECHSELWIRKUNG UND AKTAEDRISCHE LIGANDENFELDAUFSPALTUNG EINES RAEUMLICH BESCHRAENKTEN EINELEKTRONENSYSTEMS]
Peter Plath 1973 120 p refs In GERMAN
Avail: NTIS HC $8.00

The hydrogen atom is used to establish the dependences of spin-orbit interaction and ligand field effects on the dimensions of the space available to the electron system. Radial functions for the 1s ground level electron mobility of the compressed

hydrogen atom and the excited 2s, 3s, 2p, 3p, 4p, 3d, 4d, and 5d states are calculated by using the limited Kepler problem. A radial quantum number that contains the number of radial nodal planes inside the motion space is used to determine nodal behavior of the radial functions. The normalized functions are then used to calculate electron spin-orbit exchange effects and separation of electron levels in the symmetry O sub h ligand field.
Transl. by G.G.

N74-16396*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUASI-LINEAR THEORY VIA THE CUMULANT EXPANSION APPROACH
Frank C. Jones and Thomas J. Birmingham Jan. 1974 38 p refs Submitted for publication
(NASA-TM-X-70577; X-602-74-9) Avail: NTIS HC $4.00 CSCL 20H

The cumulant expansion technique of Kubo was used to derive an intergro-differential equation for $< f >$, the average one particle distribution function for particles being accelerated by electric and magnetic fluctuations of a general nature. For a very restricted class of fluctuations, the $< f >$ equation degenerates exactly to a differential equation of Fokker-Planck type. Quasi-linear theory, including the adiabatic assumption, is an exact theory for this limited class of fluctuations. For more physically realistic fluctuations, however, quasi-linear theory is at best approximate. Author

N74-16397# Cambridge Univ. (England). Dept. of Applied Mathematics and Theoretical Physics.
APPROACH TO ASYMPTOPIA DEEP INELASTIC SCATTERING AND ANNIHILATION
H. Osborn Apr. 1973 40 p refs
(DAMTP-73/13) Avail: NTIS HC $4.00

The approach to Bjorken scaling is considered in a covariant paxton model framework and two possibilities are demonstrated. Either scaling is approached like O(gamma to the minus 1 power), when all integrals are strongly convergent which may imply that the Regge limit for scaling functions is achieved relatively slowly, or the approach can be like a fractional power. By using parameters obtained elsewhere from pp yield pi + X at large transverse momentum it is suggested that scaling is achieved like gamma to the minus 1/2 power. For spin 1/2 models this entails sigma sub S/sigma sub T is approximately gamma to the minus 1/2 power. It is also shown how in the spin 1/2 case the longitudinal structure function can even scale as occurs in low order perturbation theory. The scaling functions for e(-)e(+) annihilation are also considered and it is verified that non finite asymptotic multiplicities can be obtained. The constraints of various energy momentum sum rules are carefully studied and it is shown how this leads to the usual paxton formula for the asymptotic cross sections for e(-)e(+) yields hadrons. Author

N74-16398# Illinois Univ., Urbana. Dept. of Physics.
[STRONG, ELECTROMAGNETIC, AND WEAK INTERACTIONS IN ELEMENTARY PARTICLE PHYSICS] Annual Progress Report
Apr. 1973 58 p refs
(Contract AT(11-1)-1195)
(COO-1195-257) Avail: NTIS HC $4.25

Experimental research on strong, electromagnetic, and weak interactions is summarized. A list of publications is included.
NSA

N74-16399# Rome Univ. (Italy). Inst. of Physics.
SINGLE NEGATIVE PIONS ON NEUTRON PHOTOPRODUCTION IN DEUTERIUM IN THE VICINITY OF THE PION-NUCLEON RESONANCE P SUB11, D SUB13, S SUB11 [FOTOPRODUZIONE SINGOLA DI PI(-) SU NEUTRONE IN DEUTERIO NELLA REGIONE DELLE RISONANZE PIONE-NUCLEONE P SUB11, D SUB13, S SUB11]
M. Beneventano, S. DAngelo, F. DeNotaristefani, P. Monacelli, L. Paoluzi, A. Proia, F. Sebastiani, and M. Severi 14 Dec. 1972 38 p refs In ITALIAN
(Nota-Interna-418) Avail: NTIS HC $4.00

Results on negative pion photoproduction in the range from 500 to 900 MeV incident gamma ray energy are reported. The pion beam was analyzed by an electromagnet assembly and detected by a spark chamber. The proton beams were detected by coincidence/anticoincidence telescope; using liquid hydrogen as the target. Data reduction of photographs included spatial reconstruction, cinematical reconstruction, and maximum spectral energy. Results are given for the cross sections for negative pion photoproduction and 90 degree recoil proton polarization. A comparison with other authors' results is made and reasons for discrepancies are discussed. ESRO

N74-16400# Rome Univ (Italy) Inst of Physics
QUANTUM THEORY OF SUPERRADIANCE IN SPONTANEOUS EMISSION FROM ATOMIC SYSTEMS WITH DIPOLAR COUPLING
F. DeMartini 2 Feb. 1973 33 p refs Presented at the First Taormina Res. Conf. on the Structure of Matter Polaritons, Taormina, Italy, 2-6 Oct. 1972
(Nota-Interna-431) Avail: NTIS HC $3.75

A fully quantum mechanical theory of the superradiance of an assembly of dipole-dipole coupled systems was developed, without limiting assumptions on the size or shape of the active medium and taking into account retardation in the interactions. The only hypothesis introduced corresponds to considering not too strong inter-dipole coupling that justifies a perturbative approach. It is shown, however, that the perturbative approach is well justified in actual cases, even in the case of highly condensed media such as solids. The theory is partly based on the work of Eberly-Rehler, which considers a highly dilute medium of any shape but without consideration of any sort of short-range inter-dipole coupling. ESRO

N74-16401# Rome Univ. (Italy). Inst. of Physics.
NONLINEAR OPTICS OF BULK POLARITONS
F. DeMartini 20 Feb. 1973 46 p refs Presented at the First Taormina Res. Conf. on the Structure of Matter Polaritons, Taormina, Italy, 2-6 Oct. 1972 Sponsored by CNR
(Nota-Interna-436) Avail: NTIS HC $4.50

Simple aspects of the polariton field generation and propagation in crystalline solids produced by laser pulses, starting from conventional electrodynamics and quantum mechanics, are considered. In view of recent nonlinear optics experiments involving polaritons, attention was devoted only to a few effects, namely, to nonlinear mixing processes like sum- frequency generation (SFG), difference frequency generation (DFG), and coherent scattering processes, such as those involved in the experiments of 4-photon coherent spectroscopy. A linear transient propagation theory of the fields in SFG and DFG is outlined, and the expression of the parametric gain, in either case, is valid also in the presence of spatial dispersion. Four-photon spectroscopy is further considered, and relevant experiments carried out in the field, are briefly presented. ESRO

N74-16402# Rome Univ. (Italy). Inst. of Physics.
STUDY OF PHOTON-PHOTON INTERACTIONS BY THE POSITRON ELECTRON FRASCATI STORAGE RING
G. Barbiellini (CNEN, Frascati, Italy), F. Ceradini, S. DAngelo, M. Grilli (CNEN, Frascati, Italy), S. Orito (CNEN, Frascati, Italy), L. Paoluzi, R. Santonico, T. Tsuru (CNEN, Frascati, Italy), V. Valente (CNEN, Frascati, Italy), and R. Visentin (CNEN, Frascati, Italy) 29 May 1973 21 p refs
(Nota-Interna-471) Avail: NTIS HC $3.25

Collisions between two quasi-real photons were studied in the processes e(+)e(-) yields e(+)e(-)e(+)e(-) and e(+)e(-) yields e(+)e(-)muon(+)muon(-) by tagging the forward going e(+) and or e(-) at initial e(+) and e(-) beam energies around 2 x 8000 MeV. For both processes the event rate agrees, within the statistical accuracy of 30% with the predictions of an equivalent photon calulation. In addition, it is shown that the contamination from all photon-photon processes to the previously published annihilation cross sections are 3 plus or minus 3% for e(+)e(-) yields multihadrons and less than 6% for e(+)e(-) yields pion (+)pion(-) or K(+)K(-). Author ESRO

N74-16403# Rome Univ. (Italy). Inst. of Physics.
INVESTIGATION OF PHOTON-PHOTON INTERACTIONS BY POSITRON ELECTRON BEAMS COLLIDING WITH 2.7 GeV TOTAL ENERGY
G. Barbiellini (CNEN, Frascati, Italy), F. Ceradini, M. Conversi, S. DAngelo, M. L. Ferrer, S. Orito (CNEN, Frascati, Italy)09(CNEN,

Frascati, Italy) 10(CNEN, Frascati, Italy), L. Paoluzi, R. Santonico, T. Tsuru, and R. Visentin 30 Jul. 1973 19 p refs Presented at the Intern. Colloq. on Photon-Photon Collisions in Electron-Positron Storage Rings, Paris, 3-4 Sep. 1973
(Nota-Interna-486) Avail: NTIS HC $3.00

The photon-photon interaction was investigated by positron and electron collisions at about 2.7 GeV total energy. Evidence based on 34 well identified events was obtained for the process positron electron yields positron electron, positive muon, negative muon. Such a process occurs in agreement with theoretical predictions based on the equivalent photon approximation. Results on 76 events from the process positron electron yields positron, electron, positron, electron are also reported. Author (ESRO)

N74-16404# Rome Univ. (Italy). Inst. of Physics.
A SEARCH FOR HEAVY LEPTONS WITH ELECTRON POSITRON COLLIDING BEAMS
F. Ceradini, M. Conversi, S. DAngelo, S. Orito (CNEN, Frascati, Italy), L. Paoluzi, R. Santonico, and R. Visentin (CNEN, Frascati, Italy) 5 Oct. 1973 12 p refs Submitted for publication
(Nota-Interna-495) Avail: NTIS HC $3.00

A search for heavy leptons was carried out with the Frascati positron electron storage ring by looking for (muon electron) pairs. A lower mass limit of 1.15 GeV, with 95% confidence level, was obtained for various types of heavy leptons.
Author (ESRO)

N74-16405# Science Applications, Inc., La Jolla, Calif.
USER'S GUIDE TO VERSION 2 OF ATR (AIR TRANSPORT OF RADIATION)
Louis Huszar, Lonnie J. Nesseler, and William A. Woolson Apr. 1973 92 p refs
(Contract DASA01-70-C-0090; DNA Proj. NWER-PB-045)
(AD-768414; SAI-73-534-LJ; DNA-3144Z) Avail: NTIS CSCL 18/8

The document is intended to serve as a user's manual for version 2 of the Air computer program. ATR derived from air transport of radiation, provides accurate, inexpensive and easily understood solutions to radiation environment problems at all altitudes in the atmosphere with a simple set of input commands. ATR contains parametric models of a comprehensive data base of air transport results generated by discrete ordinates techniques. The data base was generated for neutrons, secondary gamma rays, prompt gamma rays, and X-rays as a function of source energy, range, detector energy, and angle to a distance of 550 g/square cm of infinite, homogeneous air. Results at all combinations of distance and density are obtained by integral mass scaling upon infinite, homogeneous air results. Effects of the interface between air and ground and of nonuniform air density are treated as perturbation corrections. ATR resides in less than 54K of core on the Univac 1108, uses no peripheral storage, functions effectively in a time-sharing environment, and typically uses less than a single computational second per problem. Author (GRA)

N74-16406# Stanford Research Inst., Menlo Park, Calif.
INELASTIC COLLISIONS OF EXCITED ATOMS Annual Report
James R. Peterson and Ronald E. Olson 31 Oct. 1973 27 p refs
(Contract N00014-70-C-0339; NR Proj. 012-135; SRI Proj. PYU-8658)
(AD-769296; SRI-MP73-7) Avail: NTIS CSCL 07/4

Experimental and theoretical work has been directed to the understanding of interactions between atoms and molecules, where at least one of the reactants is initially electronically excited. During this report period experiments have been conducted to determine the He(2 triplet S) and He(2 singlet S) populations produced in reactions of He(+) + Cs at collision energies of 400 to 1000 eV. The results lead us to believe that either He(2 singlet S) is formed in only a low percentage of the collisions or that He(2 singlet S) is removed by collisions with Ar to the He(2 singlet P) state which radiates to the ground state of He. Experimental work is continuing to verify the reaction mechanism. Theoretical work has also been directed toward the problem of predicting the product state populations for charge transfer reactions leading to excited products. A theoretical model has been developed and applied to the He(+) + alkali systems. At this time there is reasonable agreement with experiment.
Author (GRA)

N74-16407# Mathematical Applications Group, Inc., Elmsford, N.Y.
SAM-CE MONTE CARLO CALCULATIONS OF NITROGEN AND CARBON BALL INTEGRAL EXPERIMENTS Final Report
Martin O. Cohen and Mendel Beer 28 Nov. 1973 45 p refs
(Contract DNA001-73-C-0016)
(AD-766509; MR-7033; DNA-31602) Avail: NTIS CSCL 20/8

The SAM-CE Monte Carlo computer code has been used to calculate the neutron and secondary gamma ray counting rates at detectors located near spherical samples of graphite and liquid nitrogen which are subjected to a monodirectional neutron beam. The detectors were placed at angles of 30 degrees, 50 degrees, and 125 degrees to the initial neutron flight path. The calculated counting rates are compared with experimental results obtained by Gulf Radiation Technology. Author (GRA)

N74-16648 Joint Publications Research Service, Arlington, Va.
PRACTICAL ASPECTS OF NUCLEAR SCIENCE DEFENDED
Khristo Khristov *In its* Transl. on Eastern Europe: Sci. Affairs, no. 377 (JPRS-60949) 9 Jan. 1974 p 3-5 Transl. into ENGLISH from Zemedelsko Zname (Bulgaria), 28 Nov. 1973 p 3 (For availability see N74-16646 07-34)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N74-16408 British Library Lending Div., Boston Spa (England).
SEVENTH CONFERENCE ON MAGNETIC HYDRODYNAMICS. PART 1: GENERAL AND THEORETICAL PROBLEMS OF MHD
1972 45 p Transl. into ENGLISH of the book "General and Theoretical Problems of MHD" USSR, Zinati Publishing House, 1972 In ENGLISH and RUSSIAN
(BLL-M-23125-(5828.4F)) Avail: British Library Lending Div., Boston Spa, Engl.: 5 BLL photocopy coupons

Conference papers are presented on MHD flow which include the following studies: (1) two-dimensional turbulent flow behind a cylinder, (2) two-dimensional turbulent flow behind a grid and in a duct, (3) two-dimensional turbulent flow in a duct with inhomogeneous electroconductance of the walls, (4) turbulent velocity disturbances in a MHD duct, and (5) turbulence and some stability problems of MHD flows with large velocity gradients. For individual titles, see N74-16409 through N74-16413.

N74-16409 British Library Lending Div., Boston Spa (England).
REALIZATION AND EXPERIMENTAL INVESTIGATION OF TWO-DIMENSIONAL TURBULENT FLOW BEHIND A CYLINDER c12
Yu. B. Kolesnikov and A. B. Tsinober *In its* Seventh Conf. on Magnetic Hydrodynamics. Pt. 1: Gen. and Theoret. Probl. of MHD (BLL-M-23125-(5828-4F)) 1972 5 p refs Transl. into ENGLISH of the book "General and Theoretical Problems of MHD" USSR, Zinati Publishing House, 1972 5 p (For availability see N74-16408 07-25)

The results are presented of an investigation of two-dimensional flow behind a cylinder, with its axis parallel to the magnetic field within a duct of rectangular section with insulated walls. The experiments were conducted on a horizontal mercury level. A conducting anemometer and a thermoanemometer were used for the measurements. Measurements were made of the averaged velocity profiles, the intensity of the longitudinal velocity pulses, and the two components of the electric current in the direction of the magnetic field, measured at various distances from the axis of the cylinder. Autocorrelated functions and one-dimensional Taylor spectra were also obtained. Author

N74-16410 British Library Lending Div., Boston Spa (England).
REALIZATION AND EXPERIMENTAL INVESTIGATION OF TWO-DIMENSIONAL TURBULENT FLOWS BEHIND A GRID AND IN A DUCT c12
Yu. B. Kolesnikov and A. B. Tsinober *In its* Seventh Conf. of Magnetic Hydrodynamics. Pt. 1: Gen. and Theoret. Probl. of MHD (BLL-M-23125-(5828-4F)) 1972 4 p refs Transl. into ENGLISH of the book "General and Theoretical Problems of MHD" USSR, Zinati Publishing House, 1972 4 p (For availability see N74-16408 07-25)

The results are given of an investigation of flow behind a grid formed of 10 cylinders (d = 3 mm, l = 20 mm) with axes parallel to a magnetic field. The experimental procedure and apparatus were the same as in the previous investigation. The flow behind the grid is of interest as one of the simplest of turbulent flows which closely approximates a case of homogeneous and isotropic turbulence. In this case the two-dimensional homogeneous and isotropic flow is dealt with that is formed in a magnetic field of fairly great magnitude. The measurements were carried out in sections at different distances from the grid. Author

N74-16411 British Library Lending Div., Boston Spa (England).
REALIZATION AND EXPERIMENTAL INVESTIGATION OF TWO-DIMENSIONAL TURBULENT FLOW IN A DUCT WITH INHOMOGENEOUS ELECTROCONDUCTANCE OF THE WALLS
Yu. B. Kolesnikov and A. B. Tsinober *In its* Seventh Conf. on Magnetic Hydrodynamics. Pt. 1: Gen. and Theoret. Probl. of MHD (BLL-M-23125-(5828-4F)) 1972 3 p ref Transl. into ENGLISH of the book "General and Theoretical Problems of MHD" USSR, Zinati Publishing House, 1972 3 p (For availability see N74-16408 07-25)

The results of a previously reported investigation of two-dimensional turbulent flow behind a cylinder, within a duct, are reviewed. In that experiment, circular copper insets were used. The results obtained are compared with a similar experiment in which strip insets were used. D.L.G.

N74-16412 British Library Lending Div., Boston Spa (England).
CORRELATION STUDY OF THE FORMATION OF A FIELD OF TURBULENT VELOCITY DISTURBANCES IN A MHD DUCT
I. A. Platniyeks *In its* Seventh Conf. on Magnetic Hydrodynamics. Pt. 1: Gen. and Theoret. Probl. of MHD (BLL-M-23125-(5828-4F)) 1972 4 p refs Transl. into ENGLISH of the book "General and Theoretical Problems of MHD" USSR, Zinati Publishing House, 1972 4 p (For availability see N74-16408 07-25)

The possibility of realizing two-dimensional turbulence under laboratory conditions was analyzed on the basis of available theoretical and experimental data. However, in order to obtain more reliable information concerning the character of the modification of turbulence in a magnetic field, it was necessary to carry out measurements of two-point correlations of the velocity pulses that directly characterize the spatial structure of the turbulence. A thermoanemometric investigation of the spatial correlations of the velocity pulses was conducted in a section of duct 50 x 60mm. Analysis of the results obtained allows the conclusion that the turbulence is essentially anisotropic, however, the turbulent flow to a large extent approaches the two-dimensional. Author

N74-16413 British Library Lending Div., Boston Spa (England).
TURBULENCE AND SOME STABILITY PROBLEMS OF MHD FLOWS WITH LARGE VELOCITY GRADIENTS
I. A. Platniyeks and Ya. Zh. Freyberg *In its* Seventh Conf. on Magnetic Hydrodynamics. Pt. 1: Gen. and Theoret. Probl. of MHD (BLL-M-23125-(5828-4F)) 1972 3 p refs Transl. into ENGLISH of the book "General and Theoretical Problems of MHD" USSR, Zinati Publishing House, 1972 3 P (For availability see N74-16408 07-25)

The flow in a rectangular duct with conducting walls perpendicular to the field was used for an experimental investigation of the turbulence characteristics of a flow with large velocity gradients created by a magnetic field. The results of the investigation indicate the following: (1) In spite of the direct action of the field on the velocity pulses, when the fields are small the turbulence intensity increases strongly in the zone where the velocity gradient increases with the field. (2) In the central region of the flow, the turbulence intensity decreases to a value that differs little from zero. D.L.G.

N74-16414 Yale Univ., New Haven, Conn.
A SNOWPLOW MODEL FOR THE DYNAMICS OF EXPANDING PLASMAS Ph.D. Thesis
James R. Albritton 1973 201 p
Avail: Univ. Microfilms Order No. 73-24930

An analysis was made of the retardation from free expansion of the plasma/field interface during an early phase of the explosion of perfectly conducting, field-free, collisionless plasma into a vacuum magnetic field. The dynamics of the system can be described by a multibounce model in which impulse forces due to specular reflection of the expanding plasma elements at the interface are balanced against external backpressure. Systems studied are those wherein a thin, dense interface layer is formed certain details of which are not important in the dynamics of its motion. In this case the interface layer can be approximated by a surface of finite mass per unit area moving under the influence of the external field and a snowplow model flow into it from the expanding plasma. The general equations governing snowplow model interface motion are formulated phenomenologically as conservation of mass and momentum. Dissert. Abstr.

N74-16415 Texas Univ., Austin.
RADIO FREQUENCY ASSISTED MAGNETIC MIRROR CONFINEMENT OF SINGLY IONIZED POTASSIUM IONS Ph.D. Thesis
Leonard Jay VanEssen 1973 147 p
Avail: Univ. Microfilms Order No. 73-26100

A radio-frequency assisted magnetic mirror was used to study the possibility of enhancing particle confinement in a magnetic bottle. A singly ionized, low density beam of K(+) ions was created and directed along the axis of the mirror geometry where a radio-frequency electric field was applied by means of a capacitor plate antenna located near the neck of the bottle. The principal thesis behind the experiment was that an electric field could provide particles with additional perpendicular energy which, in turn, would cause the particles to be reflected by the gradient of the magnetic field (in the absence of the electric field, the particles were free to escape from the system altogether). The above results were shown to compare favorably with the theoretical predictions obtained from the numerical solutions of the exact equations of motion for a particle constrained in the experimental geometry. Dissert. Abstr.

N74-16416 Texas Univ., Austin.
UTILIZATION OF DIGITAL SPECTRAL ANALYSIS TECHNIQUES IN THE STUDY OF PLASMA FLUCTUATION DATA Ph.D. Thesis
Donald Edward Smith 1973 157 p
Avail: Univ. Microfilms Order No. 73-26088

A 7-channel, 1.5 MHz bandwidth, analog-digital data acquisition system was developed to interface an experimental situation with a large core, storage digital computer. This enables experimentally generated data to be used in conjunction with digitally implemented spectral analysis techniques. The purpose is to utilize these spectral analysis techniques in the study of plasma fluctuation data associated with instabilities and turbulence. This study is unique in that these spectral analysis techniques allow one to determine both the frequency and spatial wave number k associated with several waves simultaneously present in the plasma. Resonant frequency and wave number selection rules associated with nonlinear interactions of waves in the plasma were also verified. Dissert. Abstr.

N74-16417 Rensselaer Polytechnic Inst., Troy, N.Y.
FEEDBACK STABILIZATION TECHNIQUES FOR LOW FREQUENCY INSTABILITIES IN THE HOLLOW-CATHODE ARC Ph.D. Thesis
John Howard Stufflebeam 1973 115 p
Avail: Univ. Microfilms Order No. 73-27234

Research in the area of remote control plasma instabilities by the technique of feedback stabilization is reported. A theoretical analysis is developed to describe the physical mechanisms of the instability. Inclusion of a term representative of the feedback suppressor signal shows control of the initial growth rate of the oscillation. A nonlinear analysis predicts the observed variations of instability amplitude when the system is perturbed by the feedback system. The experimental investigation is carried out on a hollow-cathode arc discharge in argon. The low beta plasma produced is confined by a longitudinal, uniform magnetic field and has radial density and potential gradients which give rise to a low frequency instability. Suppression of this instability is accomplished by a remote technique. Results from an earlier, localized, stabilization system, employing Langmuir probes as feedback elements, are included and compared with the remote suppression system. Dissert. Abstr.

N74-16418 Rochester Univ., N.Y.
TRAPPING STUDIES OF A LASER PRODUCED PLASMA IN A TOROIDAL QUADRUPOLE MAGNETIC FIELD Ph.D. Thesis
William David Friedman 1973 135 p
Avail: Univ. Microfilms Order No. 73-25808

The trapping of a laser produced plasma in a toroidal quadrupole magnetic field was studied. The purpose is to determine the conditions required for a laser plasma to fill magnetic confinement geometries of interest to controlled thermonuclear fusion. The plasma is created in the center of the magnetic well from a 100 micron diameter LiH pellet irradiated in free fall by a high power (150 MW) Q-switched ruby laser. The major radius of the torus is 17 cm and the field rises to equal approximately 10 kG within 1 cm of the magnetic well. Time of flight measurements yield a plasma velocity across the poloidal magnetic field of approximately 8 million cm/sec. The quadrupole magnetic field increases the fraction of the target pellet detected as ions: from less than 1 % in a free expansion, to approximately 10 % when trapped in the confinement region. In the trapped plasma, double probes give a peak density of approximately 3 x 10 to the 12th power cm to the minus 3 power.
Dissert. Abstr.

N74-16419 Dartmouth Coll., Hanover, N.H.
PARALLEL A.C. COLLISIONAL CONDUCTIVITY OF A PLASMA IN A STRONG MAGNETIC FIELD Ph.D. Thesis
Anthony J. Scannapieco 1973 114 p
Avail: Univ. Microfilms Order No. 73-27570

A calculation of the collisional component of the parallel ac electrical conductivity of a plasma in a strong magnetic field is presented. One understands strong magnetic field in the sense that in a two-body collision the Larmor radii of the colliding particles are comparable to or smaller than the distance over which the collision is effectively taking place (i.e., the Debye distance). To this end a kinetic equation first derived by N. Rostoker is used which takes into account the effect of the magnetic field during the coulomb collision process. The Rostoker equation is restricted in that only the component of the ac collisional conductivity along the magnetic field can be calculated. Dissert. Abstr.

N74-16420 Texas Univ., Austin.
TOROIDAL EFFECTS OF TEARING MODE INSTABILITIES IN TOKAMAKS Ph.D. Thesis
George Lee Flint, Jr. 1973 253 p
Avail: Univ. Microfilms Order No. 73-26005

In order to investigate toroidal effects on tearing modes in Tokamaks, stability criteria are derived by means of an expansion in the inverse aspect ratio. The stability criteria for nonresistive magnetohydrodynamic modes is modified to apply to the resistive tearing mode. Only cases in which the resistive layer falls between the plasma radius and that of a conducting wall can be treated by this method. It is shown that for a low pressure system. The toroidal effects modify this criterion favorably in fourth order. Some examples were chosen so that comparisons could be made between the current work and that of others using different criteria and treating only the cases of constant current density or pressureless plasma. Dissert. Abstr.

N74-16421 Texas Univ., Austin.
MAGNETOHYDRODYNAMIC ENTRY FLOWS IN AXIAL MAGNETIC FIELDS Ph.D. Thesis
Gerald Paul Darcy 1973 189 p
Avail: Univ. Microfilms Order No. 73-25992

A theoretical study is presented on the magnetohydrodynamic entry length for an electrically conducting liquid flow into plane channels and circular pipes. In every case, the applied magnetic field is aligned with the flow axis. All other induced magnetic fields are neglected. A parabolic distribution is used to describe the boundary layer velocity profile. This profile is used to generate an integral solution which is solved numerically. The resulting solutions show that axial magnetic fields will produce longer entry regions, bigger pressure drops, and measurable transverse pressure variations. They also show that both the channel and pipe solutions may be correlated by a single dimensionless parameter relating viscous, magnetic and inertial forces. Dissert. Abstr.

N74-16422 Cornell Univ., Ithaca, N.Y.
INTENSE RELATIVISTIC ELECTRON BEAM AND MAGNETIZED PLASMA INTERACTIONS Ph.D. Thesis
Kwo-Ray Chu 1973 106 p
Avail: Univ. Microfilms Order No. 73-28283

The problem of a nonrotational relativistic electron beam injected into a longitudinally magnetized plasma was treated before neglecting ion dynamics. The problem in the framework of two fluid plasma equations is considered. The results are essentially the same as those of the immobile ion model. As a result of the ion role, the neutralization criteria as a function of the applied magnetic field are so relaxed that within the realistic magnetic field limits, the beam will essentially be neutralized electrically for any a, and magnetically for a much greater than lambda, where a and lambda are, respectively, the beam radius and plasma skin depth. The implication here is that the concept of electrostatic heating of ions by the beam self electrostatic field will not be applicable under the present injection scheme. Dissert. Abstr.

N74-16423 Texas Univ., Austin.
TOROIDAL EQUILIBRIA OF FUSION PLASMA IN A CURVED THETA PINCH Ph.D. Thesis
Emmett Leo Cantrell 1973 129 p
Avail: Univ. Microfilms Order No. 73-25985

The engineering problems associated with stabilizing plasma drift due to the magnetic field gradient in a toroidal theta pinch are studied analytically and experimentally. The analysis is developed from the Lagrangian formulation for a dynamic circuit model. Stabilization by axial currents is realized from the formulation and agrees with reported experimental results. The formulation is applied to the equilibrium system utilizing auxiliary helical fields of l-fold symmetry. The analysis includes image currents which are spatially periodic due to varying coil-to-wall spacing. The periodicity leads to an asymmetry in the vertical plane resulting in a destabilizing vertical force on the plasma column. A modified helical system with all axisymmetric field period twice that of helical field is proposed. Analysis demonstrates that this eliminates the undesired vertical force while preserving the horizontal force needed for equilibrium. Dissert. Abstr.

N74-16424# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL RESEARCH ON MODEL MHD GENERATOR U-02 (STAGE 2), SCIENTIFIC AND TECHNICAL REPORT 17/73
11 Jan. 1974 305 p refs Transl. into ENGLISH of the book "Eksperimentalnyye Issledovaniya Modelnoy Energeticheskoy MGD Ustanovke U-02 (2 Etap), Nauchno-Tekhnicheskiy Otchet 17/73" Moscow, May 1973 305 p
(JPRS-60972) Avail: NTIS HC $17.25

The basic results are presented of stage 2 of research on a model combined MHD power plant (the U-02 installation). The research was conducted in order to investigate the basic physical processes that take place in parts of the open-cycle MHD generator. Author

N74-16425# Pisa Univ. (Italy).
EQUIVALENT CIRCUIT OF MHD GENERATOR WITH NONUNIFORM GAS [CIRCUIT EQUIVALENTE DI GENER-

ATORI M.H.D. CON GAS NON UNIFORME]
R. Dalmazzo and A. Tellini 1972 26 p refs In ITALIAN
(Rept-1429) Avail: NTIS HC $3.50

The various types of losses in MHD converters are discussed for nonuniform fluids, and the equivalent circuits are derived for two models. Transl. by F.O.S.

N74-16426# Pisa Univ. (Italy).
POTENTIAL DIAGRAMS OF MHD GENERATORS WITH CONSTANT SIZED CONDUCTORS AND WITH NONUNIFORM GAS [DIAGRAMMI DI POTENZA DEI GENERATORI M.H.D. CON CONDOTTO A SEZIONE COSTANTE CON GAS NON UNIFORMI]
R. Dalmazzo and A. Tellini 1972 24 p refs In ITALIAN
(Rept-1428) Avail: NTIS HC $3.25

Schematics of a model for an inhomogeneous MHD gas conductor are discussed, and applied to the constant potential density media for two types of inhomogeneity. Transl. by F.O.S.

N74-16427# Defence Research Establishment Valcartier (Quebec).
HOLOGRAPHIC INTERFEROMETER FOR MEASUREMENT OF PLASMA DENSITIES
P. Chevrette, R. W. MacPherson, and C. Ethier Nov. 1973 38 p refs
(DREV Proj. 97-01-38)
(DREV-R-700/73) Avail: NTIS HC $4.00

A portable holographic interferometer produces interferograms of laser induced plasmas under conditions which would normally prohibit the use of conventional interferometers. The interferograms are made with a pulsed ruby laser and may be reconstructed with white light. The effects of any emulsion shrinkage that may occur during the development of the holographic plates can be made negligible by either choosing a small angle between the object and reference beam directions or by orienting the normal of the hologram so that it bisects that angle. The sensitivity of the measurements may be increased by introducing background fringes as in conventional interferometry. The timing of the ruby laser pulse with respect to the development of the plasmas under observation is controlled over a range 0.5-10 us, microsec with an accuracy of 10 ns, by means of a simple delay circuit which was added to the laser's Pockels cell Q-switch control. Author

N74-16428# Laboratoire de Physique Theorique et Particules Elementaires, Orsay (France).
VELOCITY AUTO-CORRELATION FUNCTION AND DYNAMICAL STRUCTURE FACTOR OF THE CLASSICAL ONE-COMPONENT PLASMA
J. P. Hansen, E. L. Pollock, and I. R. McDonald (Roy. Holloway Coll.) Nov. 1973 10 p refs
(LPTHE-73/30) Avail: NTIS HC $3.00

Molecular dynamics computations are presented for the velocity autocorrelation function and the dynamical structure factor of the classical one-component plasma (O.C.P.). At high densities, the former exhibits marked oscillations, whereas the latter consists of very sharp peaks near the plasma frequency, up to wave vectors of order 1/a, where a is the ion sphere radius. The resulting dispersion curve is discussed. Author

N74-16429# Institut Franco-Allemand de Recherches, St. Louis (France).
IONIZED WAKE STUDIES USING MICROWAVE PROBES AND AN OPTICAL SPECTROMETER (APPLICATION TO RADAR ECHO) [ETUDE DU SILLAGE IONISE A L'AIDE DE SONDES HYPERFREQUENCES ET D'UN SPECTROMETRE OPTIQUE (APPLICATION A L'ECHO RADAR)]
R. Koch, H. Mach, and G. Stern 30 Nov. 1971 76 p refs In FRENCH
(Contract DTEN-70.70.198)
(ISL-RT-20/71) Avail: NTIS HC $6.00

Polycarbonate and duralumin spheres were launched in the air from a light gas gun at 6000 m/sec velocity and at pressures varying from 50 to 150 mm Hg. The ablative product wake was analyzed using microwave and spectroscopic techniques. Doppler radar diffuse light measurements were used to determine the electron density at 8.6 mm wavelength. Results were compared to those obtained with the microwave interferometry and the Fabry-Perot interferometry. The evolution of wake temperature and radiation was determined. A continuous soot spectrum was observed in the polycarbonate sphere wake and AlO band spectrum in the duraluminum sphere wake. Electron density and linearly proportional to the optical radiation in the AlO band spectrum case, in the case of continuous soot emission this correspondence followed a 1/2 power law. ESRO

N74-16430# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
LABORATORY EXPERIMENTS OF MAGNETOSPHERIC INTERESTS
C.-G. Faelthammar Oct. 1973 42 p refs Presented at the Intern. Assoc. of Geomagnetism and Aeronomy meeting on Controlled Magnetospheric Experiments, Kyoto, Sep. 1973 Submitted for publication
(TRITA-EPP-73-16) Avail: NTIS HC $4.25

There are two types of space-related laboratory experiments which complement observations and active experiments in the magnetosphere: (1) partial scale model experiments, and (2) experiments for clarifying basic plasma physical processes known or expected to be important in the magnetosphere (but without the ambition to simulate actual space configurations). The limitations and potentialities of both types are discussed, and examples of experiments are given. It is concluded that there will be an increasing need for the experiments of the second type, in particular for the clarification of the response of a thin plasma to electric fields and its ability to carry electric currents. This encompasses such key questions as the nature and role of anomalous resistivity (and electron runaway in its presence), the possible formation of double layers (and the acceleration processes associated with them), and rapid dissipation of magnetic field energy. Author (ESRO)

N74-16431# Ecole Polytechnique Federale de Lausanne (Switzerland). Centre de Recherches en Physique des Plasmas.
THE KORTEWEG-DE VRIES EQUATION FOR A TWO COMPONENT PLASMA
M. Q. Tran and P. J. Hirt Sep. 1973 12 p refs Sponsored by the Swiss Natl. Sci. Found.
(LRP-67/73) Avail: NTIS HC $3.00

A Korteweg-de Vries equation for a two component plasma with cold ions (T sub i = 0 for both species) and isothermal electrons was derived. The amplitide of the solitons is reduced drastically by a few percent of light ions, and an initial perturbation breaks up into more solitons than in a one component plasma. Author (ESRO)

N74-16432# National Physical Lab., Teddington (England). Div. of Quantum Metrology.
TEMPERATURE PROFILES IN A WALL-STABILISED ARC
R. W. Maxwell Oct. 1973 29 p refs
(NPL-QU-27) Avail: NTIS HC $3.50

Temperature distribution in a cylindrical wall stabilized argon plasma arc column was investigated in order to validate available data on plasma transport properties, in particular electrical and thermal conductivities, and the radiative losses from such a device. To obtain a preliminary estimate of the temperature profile, both a series solution and a finite difference solution of the energy equation were elaborated. The results are discussed. ESRO

N74-16433# Rensselaer Polytechnic Inst., Troy, N.Y. Plasma Dynamics Lab.
FEEDBACK STABILIZATION TECHNIQUES FOR LOW FREQUENCY INSTABILITIES IN THE HOLLOW-CATHODE ARC Ph.D. Thesis
John H. Stufflebeam May 1973 118 p refs
(Grant AF-AFOSR-2191-72; AF Proj. 9752)
(AD-768599; RPDL-73-1; AFOSR-73-1635TR) Avail: NTIS CSCL 20/9

The report describes research in the area of remote control of plasma instabilities by the technique of feedback stabilization. A theoretical analysis is developed to describe the physical mechanisms of the instability. Inclusion of a term representative of the feedback suppressor signal shows control of the initial growth rate of the oscillation. A non-linear analysis predicts the observed variations of instability amplitude when the system

is perturbed by the feedback system. The experimental investigation was performed on a hollow-cathode arc discharge in argon. (Modified author abstract) GRA

N74-16434# Magnetic Corp. of America, Cambridge, Mass.
SUPERCONDUCTING MAGNETOHYDRODYNAMIC MAGNET COMPREHENSIVE TESTING Interim Technical Report, Aug. 1972 - Apr. 1973
Zdenek J. J. Stekly and Richard J. Thome Sep. 1973 119 p
(Contract F33615-72-C-2069; AF Proj. 3145)
(AD-768626; MCAD-27; AFAPL-TR-73-44) Avail: NTIS CSCL 20/9

Extensive tests have been performed on a lightweight, high current density superconducting MHD magnet. The system bore is 0.21 m in diameter and the uniform field length (5%) is 0.88 m. During the tests, central and maximum fields of 3.9 and 5.46 Wb/square meters respectively were attained at an overall winding current density of 1.2 x 10 to the 8th power A/square meters. Operating characteristics were studied while rapidly charging and discharging the coil (times of the order of minutes). Information on load distribution in the magnet structural components was generated using a system of strain gauges with computer aided data reduction. Test results led to structural modifications which improved performance and suggest other areas where alterations may be desirable. Author (GRA)

N74-16435# Naval Research Lab., Washington, D.C.
ROTATIONAL STABILIZATION IN AXIAL FLUX COMPRESSION EXPERIMENTS Interim Report
D. L. Book and N. K. Winsor Nov. 1973 16 p refs
(NRL Proj. H02-28F)
(AD-769664; NRL-MR-2643) Avail: NTIS CSCL 20/9

The imploding metallic liner used in cylindrical flux compression experiments can be Rayleigh-Taylor unstable. Stabilization by rotation of the liner was investigated. It is shown that one can either remove the instability or limit its amplitude to a chosen value by selecting the rotation speed. The cost in conversion efficiency (initial energy into compressed magnetic field energy) of the stabilization is calculated. Author (GRA)

N74-16436# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
WAYS OF ENSURING UNIFORMITY IN THE MEASUREMENTS OF HIGH TEMPERATURES
V. V. Kandyba 5 Nov. 1973 10 p Transl. into ENGLISH from Tr. Metrol. Inst. SSSR (USSR), no. 110, 1971 p 5-9
(AD-769568; FTD-HT-23-210-74) Avail: NTIS CSCL 20/9

The paper discusses providing a uniformity of temperature measurement in plasma diagnostics. GRA

N74-16437# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE TEMPERATURE OF ELECTRONS IN A WEAKLY-IONIZED PLASMA WITH A NONLINEAR SKIN EFFECT
V. D. Pismennyi, T. V. Rakhimova, and A. T. Rakhimov 5 Nov. 1973 13 p refs Transl. into ENGLISH from Zh. Eksp. Teor. Fiz. (USSR), v. 64, no. 2, 1973 p 498-504
(AD-769569; FTD-HT-23-501-74) Avail: NTIS CSCL 20/9

The authors examine the nonlinear skin effect of electromagnetic waves in a weakly-ionized plasma under conditions of a nonlocal connection between the electron temperature and the strength of the high-frequency electric field in the plasma. It is shown that the dependence of the electron temperature established in the plasma on the intensity of the incident, electromagnetic wave can be ambiguous. As a result, when the electromagnetic waves reach a specific intensity, their coefficient of reflection from the surface of the weakly-ionized plasma can decrease abruptly. (Modified author abstract) GRA

N74-16438# Naval Research Lab., Washington, D.C.
FLUID THEORY OF REFLECTED PARTICLES IN ION ACOUSTIC SHOCKS Interim Report
Wallace Manheimer, M. and Irving Haber Sep. 1973 65 p refs
(DNA Proj. NWER-HC-040)
(AD-769235; NRL-MR-2656) Avail: NTIS CSCL 20/9

The time-independent equation of motion for a one-dimensional ion fluid of velocity v and temperature T in an electric field E is presented. This equation has a singularity at 3T. This singularity is of crucial importance in any shock whose downstream state satisfies 3T = M(v squared). Assuming a square (waterbag) ion distribution function, the singularity occurs where the first ion is reflected. By adding the presence of a second (reflected) fluid, it is possible to join these two fluids to form a single fluid beyond the singularity. Using this technique the structure of ion acoustic shocks containing reflected particles, and the solutions are identical with direct solutions of the Vlasov equation. The advantage of the fluid formulation is that one can investigate the effect of anomalous friction and energy exchange between incident and reflected beams. (Modified author abstract) GRA

N74-16439# California Univ., Irvine. Dept. of Physics.
DOPED SEMICONDUCTORS IN AN INHOMOGENEOUS MAGNETIC FIELD Final Report
S. L. Conningham and R. F. Wallis Aug. 1973 14 p refs
(Contract N00014-69-A-0200-9003; NR Proj. 015-731)
(AD-769547; TR-73-61) Avail: NTIS CSCL 20/12

It is shown that a potential difference is generated across a semiconductor sample containing free carriers when the sample is in a magnetic field gradient in the direction of the field. A measurement of the potential difference can give direct information concerning the effective mass and effective g-factor of the free carriers. Author (GRA)

N74-16440# Naval Research Lab., Washington, D.C.
X-RADIATION FROM HIGH ENERGY DENSITY EXPLODED WIRE DISCHARGES
David Mosher, Stavros J. Stephanakis, Ihor M. Vitkovitsky, Charles M. Dozier, and Leslie S. Levine Oct. 1973 11 p refs
(NRL Proj. H02-26A)
(AD-769460; NRL-MR-2666) Avail: NTIS CSCL 20/9

Exploded wire discharges of tungsten and titanium driven by a high power pulse generator have been used to produce intense X-ray continuum and line radiation. A calibrated LiF crystal spectrograph recorded the radiation spectrum in the 3 to 25 keV range. More than 20 J of X-radiation are emitted in this photon energy band by tungsten plasmas in less than 50 nsec. The source of emission is less than 1 mm in diameter and about 3.5 cm long. Author (GRA)

N74-16441# Science Applications, Inc., La Jolla, Calif.
FIELD GENERATING THERMAL INSTABILITY IN LASER-HEATED PLASMAS Interim Report
Dekek A. Tidman and Ramy A. Shanny Oct. 1973 21 p refs
(Contract N00014-72-C-0114; NRL Proj. H02-27A)
(AD-769459; NRL-MR-2667) Avail: NTIS CSCL 20/9

The intense thermal energy flux emanating from the critical layer in laser-produced plasmas is shown to generate an instability that derives from the magnetic field dependence of the thermal conductivity. This implies that B fields, with their attendant nonuniform heating effects, will occur even in uniformly irradiated spherical pellets or plane slabs. These fields may play a role in attempts to compress pellets for fusion for example by being partially trapped and amplified by compression in the interior of a pellet. Author (GRA)

N74-16442# Tel-Aviv Univ. (Israel). Dept. of Applied Mathematics.
DISCONTINUOUS MAGNETOFLUIDDYNAMIC FLOWS Final Scientific Report
Nima Geffen, Eliezer Hameiri, Levi Lustman, and Shmuel Libai Jun. 1972 55 p refs
(Contract F44620-71-C-0115; AF Proj. 9752)
(AD-769700; AFOSR-73-1989TR) Avail: NTIS CSCL 20/9

The report includes three parts: a closed form, sharp estimate for the breakdown of an initially smooth one-dimensional, time-dependent flow with various applications; a way to find where and when shocks appear in multi-dimensional flows; an analysis of a magnetohydraulic analogy to plasma flow where the dependence of the breakdown point on the physical parameters is given as well as a family of similarity solutions of the flow equations formulated in Lagrangian coordinates. The report is organized in three self-consistent parts, leading from a mathematical analysis of two independent variables (e.g., one spatial coordinate and time) through many variables (e.g., two and three

space dimensions and time) to an application and further analysis and calculation of a specific axial magnetohydraulic flow simulating various aspects of plasma flows of possible use in technological applications. GRA

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N74-16443 Cornell Univ., Ithaca, N.Y.
THE DIAMAGNETIC TRANSISTION IN A ZERO-DIMENSIONAL SUPERCONDUCTOR Ph.D. Thesis
Robert Alan Buhrman 1973 202 p
Avail: Univ. Microfilms Order No. 73-28276

A metallic superconducting particle, all of whose dimensions are less than the superconducting coherence length, can be considered to be zero-dimensional from a superconducting point of view in that spatial variations of the superconducting order parameter are energetically very unlikely within the particle. Ensembles of electrically isolated, near perfect single crystal aluminum particles satisfying this criterion were produced with the average radius ranging from over 1000A to less than 150A. With the use of the extremely sensitive superconducting quantum magnetometer, the diamagnetic transition of these samples was carefully examined over a wide range of temperatures and applied magnetic fields. The transition temperature T sub c of these samples was found to be very close to the T sub c of bulk aluminum. A small systematic increase in T sub c with decreasing particle size was observed, in qualitative agreement with the predicted effect of surface phonons on superconducting properties. Dissert. Abstr.

N74-16444 Wesleyan Univ., Middletown, Conn.
THEORY OF DILUTE MAGNETIC ALLOYS: THE MULTI-IMPURITY KONDO EFFECT Ph.D. Thesis
Yeun Chiang Tsay 1973 93 p
Avail: Univ. Microfilms Order No. 73-27631

A theory for the dilute magnetic alloy systems which exhibit both the Kondo effect and the evidence of spin dependent impurity-impurity interaction is derived using the method of equation of motion of double time temperature dependent Green function. The problem is initially approached by assuming a two-impurity s-d exchange Hamiltonian with an added exchange term between the spins of impurities, and a set of equation of motion of Green functions is derived. The resulting Green functions are truncated by the method of cumulant expansion, and solved for consistency keeping only the most divergent contributions. Results show that the presence of interacting impurities modifies strongly the Kondo effect. The theory was found to be in good qualitative and semi-quantitative agreement with some recent experimental results on dilute magnetic alloys with finite impurity concentrations, and can be regarded as a theoretical justification and background for the recently proposed concept of statistical approach. Dissert. Abstr.

N74-16445 California Inst. of Tech., Pasadena.
INFLUENCE OF COMPOSITION ON THE STRUCTURE, ELECTRIC AND MAGNETIC PROPERTIES OF PdM n-P AND Pd-Co-P AMORPHOUS ALLOYS Ph.D. Thesis
Neville Ingersoll Marzwell 1973 205 p
Avail: Univ. Microfilms Order No. 73-26471

The influence of composition on the structure and on the electric and magnetic properties of amorphous Pd-Mn-P and Pd-Co-P prepared by rapid quenching techniques were investigated in terms of (1)the 3d band filling of the first transition metal group, (2) the phosphorus concentration effect which acts as an electron donor and (3) the transition metal concentration. The structure is essentially characterized by a set of polyhedra subunits essentially inverse to the packing of hard spheres in real space. Examination of computer generated distribution functions using Monte Carlo random statistical distribution of these polyhedra entities demonstrated the reproducibility of the experimentally calculated atomic distribution function. It is shown that the degree of disorder increases from Ni to Mn. Similar behavior is observed with increase in the phosphorus concentration. Dissert. Abstr.

N74-16446 Rensselaer Polytechnic Inst., Troy, N.Y.
ON THE INTERACTION OF THE ELECTROMAGNETIC FIELDS WITH HEAT CONDUCTING DEFORMABLE SEMI-CONDUCTORS Ph.D. Thesis
Horst DeLorenzi, G. 1973 124 p
Avail: Univ. Microfilms Order No. 73-27201

The differential equations and boundary conditions describing the behavior of a semiconducting, polarizable, magnetizable, heat conducting, and finitely deformable continuum in interaction with the electromagnetic field are derived by applying the laws of continuum physics to a well-defined macroscopic model. The model consists of five interpenetrating and interacting continua which can displace with respect to each other to produce electrical current and polarization while magnetization is produced by a circulating current density in one of the continua. The different continua are allowed to interchange charge with each other in order to produce a varying degree of semiconduction. The resulting theory consists of 18 differential equations in 18 variables, but in the special case of an n-type semiconductor at constant temperature and with no magnetic field the number of equations can be reduced to four when the quasistatic approximation is used. Dissert. Abstr.

N74-16447 Polytechnic Inst. of Brooklyn, N.Y.
THE SILICON ON SAPPHIRE MOSFET: A SMALL SINGLE AMPLIFIER Ph.D. Thesis
Ram S. Ronen 1973 168 p
Avail: Univ. Microfilms Order No. 73-24785

The dissertation describes the silicon-on-sapphire (SOS) MOSFET or SIGFET, its small-signal handling properties, and several of its unique features. Examination of the physical and electrical properties of SOS films reveals that SOS is an excellent substrate material for devices such as MOSFETs, the performance of which depends primarily on the properties of the film's upper portion, the oxide grown on it, and the interface between the two. Where bulk properties are important, as for minority-carrier lifetime in bipolar transistors, bulk silicon is superior to SOS. Three areas covered in the work include:(1) Low-frequency I-V characteristics of the SOS MOSFET,(2) Interesting phenomena and special features of SOS MOSFET, and (3) Low-frequency noise behavior in MOSFETs.
Dissert. Abstr.

N74-16448 Rochester Univ., N.Y.
EXPERIMENTAL STATUS OF THE ac JOSEPHSON EFFECT IN LIQUID HELIUM Ph.D. Thesis
Donald Louis Musinski 1973 197 p
Avail: Univ. Microfilms Order No. 73-25839

The properties of mass flow were studied between two baths of superfluid liquid helium that were coupled by a small orifice when an ac sound field was present at the site of the orifice. The mass flow between these two baths depends on the intensity and frequency of the sound field, the magnitude of a gravitational head difference applied across the orifice, and a temperature difference between the two baths. Since it was desirable to record the response of the mass flow as a function of these variables separately and in various combinations, an experimental apparatus which allowed the independent variation of these parameters was used. Based on the results, it is believed that previous results which were interpreted as due to the ac Josephson effect were the same effects observed in this work and are not due to the ac Josephson effect. Furthermore, there was no evidence for the ac Josephson effect in this work.
Dissert. Abstr.

N74-16449 Ohio State Univ., Columbus.
THE EFFECTS OF ELECTRIC, MAGNETIC AND ACOUSTIC FIELDS ON THE OPTICAL AND NMR PROPERTIES OF THE NEMATIC LIQUID CRYSTAL P-METHOXY BENZYLIDENE P-N-BUTYLANILINE Ph.D. Thesis
Hugh Mailer 1973 212 p
Avail: Univ. Microfilms Order No. 73-26862

The electro-optical properties of an aligned layer of nematic liquid crystal were investigated. The initial alignment of the liquid layer was made to be normal to the surfaces of the plates of

the containing cell. This was achieved by proper surface treatment of the cell plates. A new effect, which can be described as electric field controlled tunable birefringence, was observed. This effect was found to be in agreement with the theory of birefringence in a uniaxial crystal. Hydrodynamic effects due to ionic conductivity were also observed. The alignment of the liquid layer under the action of electric and magnetic fields was examined by observing the NMR absorption line of the nematic liquid crystal. Fairly good quantitative agreement was obtained between experiment and an existing theory based on the anisotropic conductivity of nematic liquids. The effects of an acoustic wave on an aligned layer of nematic liquid crystal were also examined. Dissert. Abstr.

N74-16450 Dartmouth Coll., Hanover, N.H.
AN INVESTIGATION OF A ZINC OXIDE ON SILICON MONOLITHIC RAYLEIGH WAVE AMPLIFIER
Armand Rene Poirier 1973 79 p
Avail: Univ. Microfilms Order No. 73-27580

Thin films of zinc oxide were deposited on (111) oriented silicon substrates in order to form a structure suitable for use as a Rayleigh wave amplifier. Deposition was accomplished by dc sputtering in an 80% argon-20% oxygen atmosphere at a pressure of 10 to 15 microns and at a substrate temperature of 225 to 250 C. The resultant films were highly oriented with the c-axis perpendicular to the surface. Three amplifier structures were investigated using these films. No amplification was observed. Problems encountered with the zinc oxide sputtering and with the amplifiers are discussed. Dissert. Abstr.

N74-16451 Ohio State Univ., Columbus.
CONVERSION ELECTRON LINE SHAPE ANALYSIS AND APPLICATIONS TO MOESSBAUER SPECTROSCOPY Ph.D. Thesis
Robert Bruce Miller 1973 272 p
Avail: Univ. Microfilms Order No. 73-26872

A nondestructive method which utilizes the technique of both Mossbauer spectroscopy and Beta spectroscopy to obtain spatial information concerning the various chemical phases on the surface of a specimen is proposed and analyzed. The method, descriptively referred to as spatially resolved Mossbauer spectroscopy, would provide a means for determining pre-parabolic oxidation rate constants, alloy interdiffusion coefficients, oxygen solubilities and diffusivities in metals and alloys, and transport properties in doped alloy oxides. The technique relies on the Doppler shift of a constant velocity Mossbauer source to provide selection of the chemical phase. Nuclei in the selected chemical phase are resonantly excited by Mossbauer photons and decay by emitting monoenergetic conversion electrons. Depth information is provided by analyzing the conversion electron spectrum emerging from the surface of the specimen. Dissert. Abstr.

N74-16452 Minnesota Univ., Minneapolis.
DIFFUSION OF GERMANIUM AND SILICON IN SINGLE CRYSTAL SILICON Ph.D. Thesis
Joseph Aloysius Minahan 1973 152 p
Avail: Univ. Microfilms Order No. 73-25634

From quenching studies in germanium the formation energy for a vacancy was found by other investigators to be 2.0 + or - 0.3 eV while the migration energy for a vacancy was found to be 0.90 + 0.07 eV. Experiments performed in this research were direct measurements of the diffusion coefficient. This was accomplished by the use of Si-30 isotope combined with mass spectrometer analysis and Ge-68 isotope combined with scintillation spectrometer analysis. Two temperature dependence curves were determined for the diffusion of Ge-68 in silicon. The break in the temperature dependence curve took place around 1050 C. The activation energy calculated for the temperature region below 1050 C, being different than the activation energy calculated for higher temperatures, suggests the dominance of different mechanisms over the two temperature regions. The self-diffusion coefficient was found to be in good agreement with the coefficient determined by others. Dissert. Abstr.

N74-16453 Drexel Univ., Philadelphia, Pa.
STUDY OF FLUCTUATION PHENOMENA IN SOLID STATE PHOTOCONDUCTORS AND LIQUID CRYSTALS Ph.D. Thesis
James Theodore Hartman 1973 152 p
Avail: Univ. Microfilms Order No. 73-25523

Measurements were made of the power spectral density of the fluctuations in the photocurrent in cadmium sulphide crystals. These measurements are related to the basic transport processes in the crystal, such as diffusion, drift, generation-recombination and trapping. The trapping and Maxwellian relaxation times were derived. The experimental results were then verified theoretically using a Green's function technique in solving the appropriate transport equations for the carrier density fluctuations. Measurements were made to determine if a correlation exists between carrier density fluctuations in a cadmium sulphide crystal and fluctuations in the light passing through the crystal. No correlation was found. Measurements were made of the current fluctuations in nematic liquid crystals and of fluctuations in the light passing through them. The magnitude and spectral density of these fluctuations is related to the dynamic scattering process. Dissert. Abstr.

N74-16454 State Univ. of New York, Stony Brook.
LOCALIZED OBSTACLES TO LOW TEMPERATURE DISLOCATION MOTION IN BCC TUNGSTEN Ph.D. Thesis
John Raymond Dralla 1973 93 p
Avail: Univ. Microfilms Order No. 73-27078

The effect of interstitial elements is known to be quite important in controlling macroscopic flow in tungsten, but current understanding of the microscopic processes is limited. The present investigation examines the localized obstacles to dislocation motion in tungsten single crystals from 4.2 to 298 K using a compressional microstrain technique. Crystals of (100), (110), (111) and 14 deg -(100) orientation were studied in relation to dislocation structure and ultra-high vacuum electron bombardment purification procedures, and correlated with microstrain parameters. Ultrahigh vacuum degassing reduced both the dislocation and interstitial content while increasing the residual resistivity ratio. Comparison with chemical and partial gas-mass spectroscopy measurements for the determination of impurity content indicated total interstitial content less than 1 ppm. Dissert. Abstr.

N74-16455 Northeastern Univ., Boston, Mass.
DEFECT LEVELS IN NEUTRON-IRRADIATED Ga-As SCHOTTKY DIODES AND LASER DIODE DEGRADATION Ph.D. Thesis
Jacques Ernest Ludman 1973 113 p
Avail: Univ. Microfilms Order No. 73-28833

GaAs Schottky and laser diodes were irradiated with high energy neutrons and the resultant trap and defect structure analyzed. The Schottky diodes were irradiated with a clean high energy neutron beam from a Van de Graaff accelerator, and the laser irradiation was done in a nuclear reactor. The defect structure is shown to consist of energetically discrete trap levels but the levels are found not to operate independently. A new defect model is proposed based on coupled defect levels and is shown to be in good agreement with the observations. On the basis of this model, values for the discrete trap levels are determined. Experimentally, Schottky diodes are cooled to temperatures in the region 78 K to 178 K, the back bias is turned off and on again, and the capacitance versus time (capacitance decay) is monitored. These measurements are used to derive the activation energies of the trap levels. Trap levels are found at 175, 220,325, 380, and 460 millivolts below the conduction band. Dissert. Abstr.

N74-16456 Stanford Univ., Calif.
EXPERIMENTAL STUDIES OF THIN SUPERCONDUCTING ALUMINUM FILMS Ph.D. Thesis
Louis Brian Holdeman 1973 124 p
Avail: Univ. Microfilms Order No. 73-30411

Thin film superconducting thermometers developed especially for high resolution measurements of the specific heat of liquid helium near its superfluid transition are described. These devices have partial derivative of R/partial derivative of T is approximately equal to 1.5 million Ohms/K and temperature coefficients of resistance 1/R(partial derivative of R/partial derivative of T is approximately equal to 260 (1/K) at mid-transition, and after preconditioning by aging and thermal cycling, are reproducible within the reproducibility of germanium resistance thermometers. The superconducting transition was shown to be a sensitive

indicator of electromigration-induced change in thin aluminum films. Electromigration was shown to occur at cryogenic temperatures for ultra-thin aluminum films. The results also suggest that quantum resonances exist in the zero degree energy gap of these ultra-thin superconductors. Resistive peaks were observed in the transition curves of these very thin superconducting aluminum films. These were found on all parts of the transition curve, as opposed to only at the knee, as reported in the literature. Dissert. Abstr.

N74-16457 Oregon Univ., Portland.
THE PROPERTIES OF SUPERFLUID HELIUM BELOW 1.6 KELVIN Ph.D. Thesis
James Stephen Brooks 1973 242 p
Avail: Univ. Microfilms Order No. 73-28581

A working semiempirical model which permits the calculation of most of the properties of superfluid helium, and allows a test of the limitations of the Landau model, and the application of Bose statistics to the excitations of the liquid is presented. An empirical equation of state which relates the pressure, temperature, and density of the liquid is first developed. Next, the cumulative results of inelastic neutron scattering from elementary excitations (phonons and rotons) are examined, and the main features of the experimentally determined excitation spectrum are given in a parameterized, calculable form. Attempts and difficulties in calculating excitation-related properties from neutron data, spectrum representations, and models are reviewed, and the recent interest in the possibility of nonlinear dispersion in the low momentum region of the phonon spectrum is examined.
Dissert. Abstr.

N74-16458+ Laboratoire Central de Recherches Thomson-CSF, Orsay (France). Lab. Magnetisme.
STUDY AND DEVELOPMENT OF MEASUREMENT TECHNIQUES FOR THE CHARACTERISATION OF THIN FILM MAGNETIC PROPERTIES Final Report [ETUDE ET MISE AU POINT DE TECHNIQUES DE MESURE PERMETTANT DE CARACTERISER LES PROPRIETES MAGNETIQUES DES COUCHES MINCES]
G. Blet, J. Guidevaux, and M. Blanc Dec. 1972 89 p refs In FRENCH
(Contract DGRST-71-7-2849)
(Rept-8-570) Avail: NTIS HC $6.50

Measurement techniques for the electrical characterization of rare earth compounds and YIG are discussed. Ferrimagnetic materials with uniaxial anisotropy were considered with and without applied magnetic fields. The measurements include: polarized light observation; analysis of domain surface as a function of magnetic flux intensity with determination of the exchange constant; VHF resonance for intensity and orientation of epitaxial layer anisotropy with determination of the growth strain factor; line width measurement for the determination of the Landau and Lifchitz magnetization movement decrement; and domain wall displacement measurement. A variable incidence angle interferometric method was found most suitable for precise epitaxial layer thickness determination. ESRO

N74-16459+ Montpellier Univ. (France). Centre d'Etudes d'Electronique des Solides.
Ga(x)In(1-x)Sb COMPOSITE COMPOUNDS ELABORATION: PHYSICAL PROPERTIES AND APPLICATIONS Final Report [ELABORATION DES COMPOSES MIXTES Ga(x)In(1-x)Sb. ETUDE DES PROPRIETES PHYSIQUES ET APPLICATIONS]
B. Pistoulet, E. Groubert, J. Joullie, and G. Bougnot Sep. 1972 50 p refs In FRENCH
(Contract DGRST-70-7-2417)
Avail: NTIS HC $4.50

Two experimental devices for monocrystal elaboration of Ga/In/Sb ternary system by epitaxy are presented, and critically discussed. The liquid-solid phase diagram was calculated in the pseudoregular solution approximation and adjusted using the experimental results. For the liquidus, differential thermal analysis was used; for the solidus, microsonde analysis of epitaxy deposits was used. The epitaxy layers are described with electrical characterization results. The index varies between 0.13 and 0.85; electrical conductivity is of type n; mobility is low; and carrier density is high. The advantage of liquid epitaxy over the travelling solvent method lies in the possibility of having x higher than 0.5. ESRO

N74-16460+ Ecole Normale Superieure, Paris (France). Lab. de Physique.
ELECTRON GAS IN THE FAR INFRARED: Ni AND HgTe CYCLOTRON RESONANCE, INFRARED RESPONSE OF A JOSEPHSON LOOP Final Report [SUR QUELQUES PROBLEMES DU GAZ D'ELECTRON DANS L'INFRAROUGE LOINTAIN: RESONANCE CYCLOTRON DU NICKEL, DE HgTe, REPONSE INFRAROUGE D'UNE BOUCLE JOSEPHSON]
A. Libchaber Dec. 1972 13 p refs In FRENCH
(Contract DGRST-67-0-1082)
Avail: NTIS HC $3.00

Three problems on electron gas behavior in IR are studied. Ni cyclotron resonance in the 4 to 0.5 mm wavelength range with magnetic fields up to 27 kG was considered. Results show that resonances do not appear until 12 kG and that the resonance positions are periodic. At higher magnetic inductions, surface impedance oscillations were observed corresponding to the de Haas van Alphen (dHvA) frequency of the Fermi neck. The effective masses in a crystallographic plane already found by the dHvA method were confirmed. Magneto absorption of HgTe is investigated. Results are given for transmission studies of thin samples in the presence of magnetic fields in the geometries of Voigt and Faraday. A comparison between theoretical and experimental energy transitions is given yielding values of the effective mass and Laude factor. A technique for the realization of Dayem bridges in Josephson junction is also detailed. ESRO

N74-16461+ Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
NEW POSSIBILITIES IN AMPLIFICATION AND OSCILLATION BY PARALLEL GROUPING OF AVALANCHE DIODES TUNED TO DIFFERENT DYNAMIC REGIMES Final Report [POSSIBILITES OFFERTES EN AMPLIFICATION ET OSCILLATION PAR L'ASSOCIATION EN PARALLELE DE DIODES A AVALANCHE REGLEES A DES REGIMES DYNAMIQUES DIFFERENTS]
D. Delagebeaudeuf 5 Oct. 1972 50 p refs In FRENCH
(Contract DGRST-71-7-2858)
Avail: NTIS HC $4.50

Parallel IMPATT diode circuits for linear reflexion amplifiers are presented. A theoretical treatment of the dynamic conductance of avalanche diodes, together with results in reflexion amplification and nonlinear coefficient calculations are detailed. These results are applied to amplifier compression in the case of: one diode tuned to optimal linearity; and two diodes in parallel tuned at different dynamic regimes. Experimental results show that the two diode arrangement yields, at a compression gain of 1 db, a fourfold output power increase for a total energy consumption reduced by a factor of 2. The formulas permit further calculations of the diode section and polarization current required for optimum device functioning. ESRO

N74-16462*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EPITAXIAL GROWTH OF 6H SILICON CARBIDE IN THE TEMPERATURE RANGE 1320 C TO 1390 C
Herbert A. Will and J. Anthony Powell Washington Feb. 1974 16 p refs
(NASA-TN-D-7558; E-7677) Avail: NTIS HC $2.75 CSCL 20B

High-quality epitaxial layers of 6H SiC have been grown on 6H SiC substrates with the grown direction perpendicular to the crystal c-axis. The growth was by chemical vapor deposition from methyltrichlorosilane (CH_3SiCl_3) in hydrogen at temperatures in the range of 1320 to 1390 C. Epitaxial layers up to 80 microns thick were grown at rates of 0.4 microns/min. Attempts at growth on the (0001) plane of 6H SiC substrates under similar conditions resulted in polycrystalline cubic SiC layers. Optical and X-ray diffraction techniques were used to characterize the grown layers. Author

N74-16463*# Kanner (Leo) Associates, Redwood City, Calif.
METASTABLE MIXED CRYSTALS WITH QUARTZ STRUCTURE WITH THE OXIDE SYSTEM Li_2O-MgO-ZnO-Al_2O_3-

SiO2
J. Petzoldt Washington NASA Feb. 1974 36 p refs Transl. into ENGLISH from Glastechn. Ber. (Mainz), v. 40, no. 10, Oct. 1967 p 385-396
(Contract NASw-2481)
(NASA-TT-F-15340) Avail: NTIS HC $4.00 CSCL 20B

The pseudoquaternary system LiAlO2-MgAl2O4-ZnAl2O4-SiO2 is studied. The concentrations of the four components in glasses which, upon crystallization, yield metastable mixed crystals with quartz structure are determined. Crystallization is carried out at temperatures between 800 and 1000 C. The glasses contain 2% TiO2 and 2% ZrO2 by weight as nucleating agents. The thermal expansion coefficients and hexagonal lattice constants of crystals prepared in this manner are measured as functions of the composition of the glass from which they crystallized. The effects of the various components on crystallization, expansion properties, and lattice constants are analyzed. Author

N74-16464# Illinois Univ., Urbana. Dept. of Metallurgy and Mining Engineering.
DISLOCATION VELOCITY MEASUREMENTS IN HIGH PURITY NIOBIUM
Robert P. Walson and Howard K. Birnbaum Oct. 1973 139 p refs
(Contract N00014-67-A-0305-0020)
(AD-769129) Avail: NTIS CSCL 11/6

The velocity of screw dislocations on (211) planes, mixed dislocations on (101) planes, and mixed dislocations on (211) planes has been investigated microscopically in ultra-high purity niobium single crystals using Berg-Barrett X-ray topographs and chemical etching techniques. The Berg-Barrett X-ray topographic technique was found to be unsatisfactory for resolving individual dislocations or slip lines in the niobium used in this investigation. Chemical etching on the other hand produced satisfactory results and allowed the study of individual dislocations. An asymmetry of the velocity of screw dislocations on (211) planes was observed between a state of compression and a state of tension at room temperature. The screw and mixed dislocation velocities could be described by a power law dependence on stress. (Modified author abstract) GRA

N74-16465# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
MEASUREMENT OF CESIUM/SILICON N POTENTIAL BARRIER Final Report [MESURE DE LA BARRIERE DE POTENTIEL CESIUM-SILICIUM N COMPTE RENDU DE FIN DE CONTRAT]
N. Szydlo May 1972 19 p refs In FRENCH
(Contract DGRST-71-7-2840)
(Rept-2668) Avail: NTIS HC $3.00

An experimental device was developed which allows the fabrication of K-Si (N), Cs-Si (N), and Cs-Si (P) diodes. The device also determines the height of the barrier between these metals and silicon (3) cleaved in vacuum by analysis of direct and inverse current-voltage curves. The values were found to be 0.46 eV, 0.43 eV, and 0.56 eV respectively, with an accuracy of 0.03 eV. These results, as well as those for the Na-Si (N) contact (0.43 eV), show that the correlation established by Cowley and Sze between the potential barrier and the work function of the metal is no longer valid for alkaline metals with small work function. The Cowley-Sze model can only be applied in case of an important increase in interface state density near E-EV = 0.43 eV. ESRO

N74-16466# Hebrew Univ., Jerusalem (Israel).
ON THE FEASIBILITY OF OBSERVING PHOTOEMISSION FROM METAL CONTACTS INTO ANTHRACENE Final Technical Report, Jul. 1972 - Jun. 1973
J. Levinson, Z. Burshtein, and A. Many Jul. 1973 36 p refs
(Contract DAJA37-72-C-4347; DA Proj. 2O0-61102-B-31E)
(AD-768409; ARDG(E)-E-1437) Avail: NTIS CSCL 20/12

This work completes the study of the two processes which can mask, partly or completely, photoemission from metal contacts into anthracene: carrier photoexcitation out of surface traps which are occupied under thermal equilibrium, and photoexcitation out of bulk traps which are continuously being filled by carrier injection from the contact under study. The first process is studied by photoconductivity measurements in the absence of contact effects. The photocurrents are shown to originate from hole photoexcitation out of surface traps. They are greatly influenced by surface treatments but even under the most optimal treatment the spectral yield is similar both in magnitude and threshold to yield curbes obtained by several workers and attributed to photoemission. For the second process, the arguments presented suggest that with contacts of alkali and alkaline-earth metals (electron injectors) and gold (Hole injector) the reported yield curves are probably associated with photo-enhanced space-charge-limited current. (Modified author abstract) GRA

N74-16467# California Inst. of Tech., Pasadena. Dept. of Electrical Engineering.
ANALYSIS OF SEMICONDUCTOR STRUCTURES BY NUCLEAR AND ELECTRICAL TECHNIQUES Final Report, Dec. 1970 - Dec. 1972
Robert W. Bower, Eri-K Chu, Jacob D. Haskell, Aki Kiraki, and Mototaka Kamoshida 5 May 1973 54 p refs
(Contract F19628-71-C-0056; AF Proj. 5638)
(AD-768444; AFCRL-TR-73-0368) Avail: NTIS CSCL 20/12

The report covers three relatively distinct areas of investigations; studies of Al2O3 and Si3N4 thin films, reactions in thin solid films and doping by ion implantation. Common to all this work is the use of ion backscattering spectrometry as the principle analytical tool, supported by a number of other techniques. Among these, X-ray diffraction and scanning electron microscopy were found to be particularly well suited to supplement backscattering. (Modified author abstract) GRA

N74-16468# Army Electronics Command, Fort Monmouth, N.J.
SURFACE PREPARATION AND CHARACTERIZATION TECHNIQUES FOR QUARTZ RESONATORS
J. Vig, H. Wasshausen, C. Cook, M. Katz, and E. Hafner Aug. 1973 50 p refs
(DA Proj. 1S6-62705-A-058)
(AD-768705; ECOM-4143) Avail: NTIS CSCL 09/1

An investigation was made of various polishing and cleaning techniques for quartz crystals. The surface topographies of polished crystals were investigated by transmission electron microscopy, with resolutions down to 15A. Large differences in surface qualities were revealed among crystals prepared with different polishing techniques. The polishing processes which to date produced the most defect-free surfaces are described. The surface crystallinities were investigated by high energy electron diffraction (HEED). Clearly defined Kikuchi lines were observed indicating that if there is a disturbed surface layer, its thickness is less than 100A. The effectiveness of the hydrogen peroxide based cleaning procedure was investigated by Auger electron spectroscopy. A fraction of a monolayer of carbon was the only observable contaminant on the surface after this procedure was used. Atomically clean quartz surfaces could be produced by ion bombardment cleaning, but the ion bombardment itself produced some undesired side effects. The effects of the electron beam and of the ion beam are discussed. (Modified author abstract) GRA

N74-16469# California Univ., Riverside. Dept. of Physics.
A NOTE ON THE ANISOTROPY OF THE CONDUCTIVITY IN THIN AMORPHOUS FILMS
M. Pollak and J. J. Hauser 1973 15 p refs Prepared in cooperation with Bell Telephone Labs., Inc., Murray Hill, N. J.
(Contract N00014-69-A-0200-5005)
(AD-769549) Avail: NTIS CSCL 20/12

A new interpretation of the anisotropy of the conductivity in thin films of a-Ge, and a-Si, reported by one of us (J.J.H.) is presented. The interpretation is based on a transition, previously proposed by the other author, from percolation conduction to Miller and Abrahams conduction at small film thickness. A simple theory together with experimental data is presented. The comparison between them is found to be good. Author (GRA)

N74-16470# California Univ., Riverside. Dept. of Physics.
INTERPRETATION OF ac CONDUCTIVITY IN AMORPHOUS SEMICONDUCTORS
M. Pollak 1973 56 p refs
(Contract N00014-69-A-0200-5005)
(AD-769550) Avail: NTIS CSCL 20/12

An extensive survey of the experimental literature on ac conductivity and on the dielectric dispersion in glasses is reported. The region where sigma = A(omega squared), s about = 1 is considered. The various materials seem to fall into two groups. The characteristic features of the one are a relative insensitivity of both A and s to temperature, with s about 0.8. In the second group A increases as a high power of T, while s varies from about 1 at low temperatures to about 0.8 at high temperatures. A variety of possible models is examined in some detail. It is found that the behavior of the first group is well explained by phonon assisted hopping. The other group can be explained only when certain correlation effects are taken into account. When this is done, either hopping over a barrier, or phonon assisted hopping with a subsequent lattice relaxation (e.g. polaron hopping), is consistent with the experimental results. (Modified author abstract) GRA

N74-16471# Northwestern Univ., Evanston, Ill. Dept. of Physics.
NMR-IN CERIUM-TIN-INDIUM ALLOYS
L. B. Welsh and J. B. Darby, Jr. (Argonne Natl. Lab.) 1973 8 p refs Repr. from Am. Inst. of Phys., no. 10, 1973 p 1325-1329
(Grant AF-AFOSR-2012-71)
(AD-767751/1GA; AFOSR-73-1793TR) Avail: NTIS CSCL 20/12

A study of the Sn(119) NMR Knight shifts and spin-lattice relaxation time was made in the CeSn(x)in(3-x) alloy system for 0.6 < or = x < or = 0.3 to determine the variation of the magnetic bahavior of Ce f-electron with x. For CeSn3, the Sn NMR properties are qualitatively similar to those of LaSn3 which is consistent with the Ce f-electron occupying a virtual bound state. The NMR properties of the alloys are consistent with a sharp increase in the f-electron susceptibility with decreasing x down to x-1.8 and suggest that a local moment picture for Ce f-electron may be roughly correct for 0.6 < or = 1.8. Author (GRA)

N74-16472# Aerospace Corp., El Segundo, Calif.
GROWTH TWINNING AND STACKING FAULTS IN CORUNDUM Technical Report, Jul. 1961 - Jan. 1963
A. B. Chase, E. Stofel, and K. Janowski 29 Oct. 1973 30 p refs
(Contract F04701-73-C-0074)
(AD-768963; TR-0074(9230-01)-2; SAMSO-TR-73-303) Avail: NTIS CSCL 20/2

Several corundum crystals grown by the flux method were etched with hot KHSO4 and studied with an optical microscope. Examination showed a new form of line and pit pattern in addition to the more usual patterns formed by twin boundaries and dislocations. Several photographs and a simple model of atomic packing arrangement are presented to show that the new patterns probably are the result of stacking faults and partial dislocations. Author (GRA)

N74-16473# California Univ., Berkeley.
SUPERCONDUCTING WEAK LINKS FOR MIXING AT MILLIMETER-WAVE FREQUENCIES Final Report, 15 Jun. 1970 - 14 Jun. 1973
T. VanDuzer 1973 8 p refs
(Contract DA-ARO(D)-31-124-70-G60; DA Proj. 200-61102-B-31E)
(AD-768802; AROD-8324-13-E) Avail: NTIS CSCL 20/12

The goals of the work were to fabricate superconductive thin-film constrictions with an electron microscope and to test them as mixers. During the grant period indium and vanadium constrictions were made with submicron dimensions and these were tested in detection and mixing modes. Most of the tests were conducted at X-band frequencies and some were done at V-band. A computer program was developed to study the theoretical behavior of a circuit model of Josephson devices such as thin-film constrictions. Considerable information was derived from the calculations and good agreement with experiments was obtained in some cases. In the process of developing sufficient understanding of electron-resist exposures, the author worked out a theory which gives general guidance for the use of electron resists for microdevice fabrication. Simple arrays of two and three devices were studied under dc conditions. A theoretical description of a generally asymmetric array was developed, taking account of the self- and mutual inductances. GRA

N74-16474# Watervliet Arsenal, N.Y.
FORBIDDEN Si (442) STRUCTURAL FACTORS
A. Marcus Gray Sep. 1973 15 p refs
(DA Proj. 1T0-61101-A-91A)
(AD-768088; R-WV-N-6-33-73) Avail: NTIS CSCL 20/2

A recent measurement by Trucano and Batterman of the forbidden Si (442) X-ray structure factor prompted the author to calculate this value by using a simple model for the electronic charge distribution with parameters determined from a given set of allowed formfactors. For the allowed formfactor experimental values of Raccah et al were used. For T = OK it was found that F(442) = 0.082 plus or minus 0.010, compared to Trucano and Batterman's bond value of 0.089 plus or minus 0.007 converted to T = OK. (Modified author abstract) GRA

N74-16475# Ohio State Univ. Research Foundation, Columbus. Electronic Materials and Devices Lab.
RESEARCH ON THE PREPARATION AND PROPERTIES OF SEMICONDUCTOR COMPOUNDS AS ALUMINUM ANTIMONIDE Final Report, 1 Apr. 1972 - 31 Aug. 1973
A. E. Middleton, W. J. Collis, J. W. Harpster, and H. K. Dave 20 Oct. 1973 98 p refs
(Contract N00014-67-A-0232-0015; NR Proj. 015-243)
(AD-769242; OSURF-3411-2) Avail: NTIS CSCL 20/12

New semiconductors with improved properties are required for both gamma radiation detectors and solar cells. Aluminum antimonide qualifies as a candidate material for both devices, but at the present time it is not developed for usage. Basic investigations of purification, Czochralski and LEC-modified crystal growth, vacuum baking of aluminum, passivation, doping, ion implantation, and p-n junction formation were studied in this research. Methods of processing were developed, including atmospheric control, cutting, polishing, lapping, etching, and electrical contacting specifically required for AlSb. X-ray orientation and mass spectrographic analyses, as well as electrical analyses, were conducted on representative crystals. Majority carrier transport characteristics versus temperature and optical density on first, second, and third generation growth crystals were determined. The formation of p-n junctions using grown junction techniques was accomplished. Author (GRA)

N74-16476# Stanford Univ., Calif. Center for Materials Research.
NEW SUPERCONDUCTORS Final Technical Report, 1 Aug. 1970 - 31 Jul. 1973
James P. Collman and William A. Little Oct. 1973 91 p refs
(Contract N00014-67-A-0112-0056; ARPA Order 1681)
(AD-769630; CMR-73-12) Avail: NTIS CSCL 07/2

The report covers work on the study of possible high temperature superconductors. It describes theoretical work on filamentary organo-metallic materials - the conduction mechanism, band theory, and screening; progress towards the synthesis of metallic chain compounds and related organo-metallic complexes, and experimental studies of their solid state properties. Author (GRA)

N74-16477# New Mexico Univ., Albuquerque. Bureau of Engineering Research.
THERMAL OXIDATION OF GALLIUM ARSENIDE PHOSPHIDE
Leo Edward Coerver and W. W. Grannemann Aug. 1973 229 p refs
(Contract N00014-68-A-0158)
(AD-769628; EE-211(73)ONR-005) Avail: NTIS CSCL 09/1

The work covers the most important basic facts about the thermal oxidation of gallium arsenide phosphide. The work is confined to lightly doped GaAs(1-x)P(x) material with a phosphorus mole fraction of 0.50 plus or minus 0.02. Growth speed of the film at temperatures near 700C was measured. The upper bound on the oxidation temperature was found. The insulator film was shown to be beta-Ga2O3 and berlinite-type GaPO4. Relative concentrations of the two compounds were obtained by two completely independent experiments. An ion backscattering

experiment showed the existence of a disordered layer below the insulator film. Capacitance vs voltage data were obtained from a large number of MIS capacitors. GRA

N74-16478# Utah Univ., Salt Lake City. Dept. of Physics.
ELECTRONIC AND RADIATION DAMAGE PROPERTIES OF RUTILE Progress Report, 1 Aug. 1972 - 15 Aug. 1973
John W. DeFord, Owen W. Johnson, and Franz Rosenberger 15 Aug. 1973 27 p refs
(Contract DAHC15-73-G-0002; ARPA Order 1610)
(AD-768795) Avail: NTIS CSCL 20/12

The basic theory and equations describing diffusion of charged ions in a semiconductor (or insulator) such as TiO2, in the presence of electric fields induced by variation of the concentration of these ions, was outlined in the last progress report. The resulting coupled differential equations (which are non-linear) cannot be solved analytically, except for certain limiting cases which are not particularly helpful, and hence must be treated numerically. A major portion of the effort during this period has been devoted to developing a computer program to handle this problem. Other areas of research include electron spin resonance measurements, associated lattice defects or impurities always present in the lattice, and crystal growth and characterization. GRA

N74-16645 Joint Publications Research Service, Arlington, Va.
SEMICONDUCTOR INDUSTRY DEVELOPMENT PROGRAM OUTLINED
Stanislaw Gondek *In its* Transl. on Eastern Europe: Sci. Affairs, No. 380 (JPRS-61017) 18 Jan. 1974 p 40-46 Transl. into ENGLISH from Radioamator i Krotkofalowiec, (Poland), no. 11, Nov. 1973 p 363-365 (For availability see N74-16643 07-34)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N74-16479*# Pennsylvania State Univ., University Park. Mechanical Engineering Dept.
BURNING RATE RESPONSE OF LIQUID MONOPROPELLANTS TO IMPOSED PRESSURE OSCILLATIONS
C. B. Allison Jan. 1974 138 p
(Grant NGR-39-009-077)
(NASA-CR-134541) Avail: NTIS HC $9.00 CSCL 21I

The combustion characteristics of hydrazine strands were studied under both steady state and oscillatory conditions. A steady strand burner was used to measure steady strand burning rates, liquid temperature distributions and surface temperatures as a function of pressure in the pressure range of 0.32 to 42 atm. It was found that for subatmospheric pressures the burning rate varied as the square root of pressure; for pressures greater than atmospheric the burning rate varied linearly with pressure. A theoretical model of the strand combustion system was developed and matched to the steady burning rates by assuming a reaction order of one for subatmospheric pressures and a reaction order of two for pressures greater than atmospheric. The model was also found to be in good agreement with measurements of liquid temperature distributions and surface temperatures. The results show an increse in the response of the combustion process as interaction occurs with transient liquid phase effects, yielding a band of frequencies where the combustion process exerts sufficient amplifying power to provide a mechanism for driving combustion instability. Author

N74-16480# Bell Aerosystems Co., Buffalo, N.Y.
POWDER ROCKET FEASIBILITY EVALUATION Final Technical Report, 21 Feb. 1972 - 1 Mar. 1973
H. Joseph Loftus, D. Marshall, and L. N. Montanino Apr. 1973 88 p refs
(Contract F04611-72-C-0045; AF Proj. 3058)
(AD-769283; BA-8651-928001; AFRPL-TR-73-22) Avail: NTIS CSCL 21/9

The objective of this evaluation was to investigate the feasibility of the powder rocket concept. A series of rocket combustor tests were conducted at 500 and 900 pound thrust levels using ammonium perchlorate/aluminum propellants. Eight 500 pound thrust fire tests were conducted to determine the effect of propellant variations on combustion. Particle size affected combustion stability with smoother combustion obtained with reduced particle size. Combustion oscillations of plus or minus five percent of mean chamber pressure at a frequency of 140 Hertz occurred using three micron (X-65) Al and twenty micron AP which was the smoothest fire test. However, partial plugging of the AP injector occurred which was attributed to the agglomeration tendency of the finer AP. A test with AP containing 0.2 weight percent silica additive, improved the AP flow character but increased combustion oscillation level to plus or minus thirty-eight percent of mean Pc. Author (GRA)

N74-16481# European Space Research and Technology Center, Noordwijk (Netherlands).
PERFORMANCE OF SATELLITE PROPELLANT-STORAGE SYSTEMS
P. Erichsen Oct. 1973 22 p refs
(ESRO-TN-117-ESTEC) Avail: NTIS HC $3.25

Possibilities for minimizing the mass of satellite propulsion systems were studied because the mass of propellant plus tank represents an important part of the overall mass of satellite auxiliary propulsion systems and because the tank mass is an important factor especially for compressed gas. The propellant storage effective velocity characterizes the propulsive performance of a gas-jet system, better than the thrust-exhaust velocity. The need to specify and monitor tank performance factor during the design and manufacture of high-pressure vessels was stressed. Nitrogen, Freon 14, and methane are shown to be optimum choices of propellant for lightweight compressed gas storage systems with tanks made of titanium alloy. ESRO

N74-16482# Aerojet Solid Propulsion Co., Sacramento, Calif.
DEVELOPMENT OF A SOLID ROCKET PROPELLANT NONLINEAR VISCOELASTIC CONSTITUTIVE THEORY. VOLUME 2: APPENDICES Final Report, May 1971 - Jun. 1973
Richard J. Farris and Richard A. Schapery (Tex. A and M Univ., College Station) Edwards, Calif. AFRPL Jun. 1973 314 p refs 2 Vol.
(Contract F04611-71-C-0046)
(AD-769263; AFRPL-TR-73-50-Vol-2) Avail: NTIS CSCL 21/9

Contents: Studies on the nonlinear viscoelastic behavior of solid propellant; Preprocessor code NL001; Post processor code; Characterization code NL002; Characterization Code NL003; Subprograms; Computerized characterization procedures for linear viscoelastic materials using arbitrary deformation histories; Samples of experimental data. GRA

N74-16483# Pratt and Whitney Aircraft, West Palm Beach, Fla.
INFLUENCE OF FUELS AND LUBRICANTS ON TURBINE ENGINE DESIGN AND PERFORMANCE, FUEL AND LUBRICANT ANALYSES Final Technical Report, 30 Mar. 1971 - 30 Mar. 1973
Richard L. Bucknell Wright-Patterson AFB, Ohio AFAPL Jun. 1973 273 p
(Contract F33615-71-C-1470; AF Proj. 3048)
(AD-769309; PWA-FR-5673; AFAPL-TR-73-52-Vol-2) Avail: NTIS CSCL 21/4

An analytical study was conducted to determine the requirements for future fuels and lubricants research based on design studies of a high Mach number afterburning turbojet and a higher Mach number advanced multicycle turboramjet. Fuel and lubrication systems were defined, and computer models were developed for their thermal analyses. Fuel and lubricant stream temperature profiles were computed, and the effects of design modifications on these temperatures were evaluated. Fuel and lubricant temperatures were calculated for baseline missions, for steady-state flight envelope points, for alternate aircraft/engine interface fuel temperatures, and for transient maneuvers. (Modified author abstract) GRA

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magneto-hydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N74-16484*# Martin Marietta Corp., Orlando, Fla.
WARM GAS TVC DESIGN STUDY Final Technical Report
Seth B. Moorhead, Jr. Sep. 1973 87 p refs
(Contract NAS8-28651)
(NASA-CR-120129; OR-12796) Avail: NTIS HC $6.50 CSCL 21H

A warm gas thrust vector control system was studied to optimize the injection geometry for a specific engine configuration, and an injection valve was designed capable of meeting the base line requirements. To optimize injection geometry, studies were made to determine the performance effects of varying injection location, angle, port size, and port configuration. Having minimized the injection flow rate required, a warm gas valve was designed to handle the required flow. A direct drive hydraulic servovalve capable of operating with highly contaminated hydraulic fluid was designed. The valve is sized to flow 15 gpm at 3000 psia and the direct drive feature is capable of applying a spool force of 200 pounds. The baseline requirements are the development of 6 deg of thrust vector control utilizing 2000 F (total temperature) gas for 180 seconds on a 1.37 million pound thrust engine burning LOX and RP-1 at a chamber pressure of 250 psia with a 155 inch long conical nozzle having a 68 inch diameter throat and a 153 inch diameter exit. Author

N74-16485*# Pratt and Whitney Aircraft, West Palm Beach, Fla.
SINGLE-STAGE EXPERIMENTAL EVALUATION OF TANDEM-AIRFOIL ROTOR AND STATOR BLADING FOR COMPRESSORS. PART 7: DATA AND PERFORMANCE FOR STAGE E
J. G. Cheatham 28 Jan. 1974 280 p refs
(Contract NAS3-11158)
(NASA-CR-134529; FR-5955) Avail: NTIS HC $16.00 CSCL 21E

An axial flow compressor stage, having tandem airfoil blading, was designed for zero rotor prewhirl, constant rotor work across the span, and axial discharge flow. The stage was designed to produce a pressure ratio of 1.265 at a rotor tip velocity of 757 ft/sec. The rotor has an inlet hub/tip ratio of 0.8. The design procedure accounted for the rotor inlet boundary layer and included the effects of axial velocity ratio and secondary flow on blade row performance. The objectives of this experimental program were (1) to obtain performance with uniform and distorted inlet flow for comparison with the performance of a stage consisting of single-airfoil blading designed for the same vector diagrams and (2) to evaluate the effectiveness of accounting for the inlet boundary layer, axial velocity ratio, and secondary flows in the stage design. Author

N74-16486# National Aerospace Lab., Tokyo (Japan).
SOME CONSIDERATIONS ON THE PERFORMANCE OF THE FAN JET ENGINE
Tadao Torisaki, Mitsuo Morita, and Shizuo Sekine 1973 32 p refs In JAPANESE; ENGLISH summary
(NAL-TR-317) Avail: NTIS HC $3.75

Thermodynamic cycle calculations of the fan jet engine were made under several conditions of by-pass ratios, cycle pressure ratios, turbine inlet temperatures at sea level, and flight Mach numbers. The optimum condition for the fan engine was decided such that the thrust ratio reached a maximum, thus allowing the engine performance to be evaluated. Optimum fan engine designs were also obtained. Test results show that: (1) optimum condition is obtained when the ratio of the exit velocity of by-passed air flow to that of gas flow is equal to the product of the fan adiabatic efficiency and the low pressure turbine adiabatic efficiency, (2) optimum by passed ratio can be determined from the ratio of the flight velocity to the equivalent velocity of the gas generator, and (3) optimum fan pressure ratio can be considered as the function of flight Mach number only. Author

N74-16487*# TRW Systems Group, Redondo Beach, Calif.
POWER PROCESSOR FOR A 20CM ION THRUSTER Final Report, 1 Jun. 1971 - 15 Oct. 1972
J. J. Biess, A. D. Schoenfeld, and E. Cohen Oct. 1973 276 p
(Contract NAS3-14383)
(NASA-CR-121160; TRW-20384-6002-RU-00) Avail: NTIS HC $16.00 CSCL 21C

A power processor breadboard for the JPL 20CM Ion Engine was designed, fabricated, and tested to determine compliance with the electrical specification. The power processor breadboard used the silicon-controlled rectifier (SCR) series resonant inverter as the basic power stage to process all the power to the ion engine. The breadboard power processor was integrated with the JPL 20CM ion engine and complete testing was performed. The integration tests were performed without any silicon-controlled rectifier failure. This demonstrated the ruggedness of the series resonant inverter in protecting the switching elements during arcing in the ion engine. A method of fault clearing the ion engine and returning back to normal operation without elaborate sequencing and timing control logic was evolved. In this method, the main vaporizer was turned off and the discharge current limit was reduced when an overload existed on the screen/accelerator supply. After the high voltage returned to normal, both the main vaporizer and the discharge were returned to normal. Author

N74-16488# Technische Univ., Berlin (West Germany).
CONTRIBUTION TO THE MEASUREMENT OF MEDIAN INDUCED PRESSURE IN PISTON MACHINES, ESPECIALLY IN HIGH SPEED COMBUSTION ENGINES Ph.D. Thesis [BEITRAG ZUR MESSUNG DES MITTLEREN INDIZIERTEN DRUCKES BEI KOLBENMASCHINEN, INSBESONDERE SCHNELLAUFENDEN VERBRENNUNGSMOTOREN]
Horst Polzin 1972 140 p refs In GERMAN
Avail: NTIS HC $9.00

Electronic measurements of net brake horsepower and fuel consumption are used to calculate median induced pressure, mechanical effectiveness, and quality coefficient of a piston engine. A photoelectric scanning impulse disk fastened to the crankshaft provides the necessary piston stroke information for analog to digital processing. Transl. by G.G.

N74-16489*# Rocketdyne, Canoga Park, Calif.
ADVANCED SPACE ENGINE PRELIMINARY DESIGN
A. T. Zachary Oct. 1973 504 p refs
(Contract NAS3-16751)
(NASA-CR-121236; R-9269) Avail: NTIS HC $27.25 CSCL 21H

Analysis and design of an optimum LO2/LH2, combustion topping cycle, 88,964 Newtons (20,000-pound) thrust, liquid rocket engine was conducted. The design selected is well suited to high-energy, upper-stage engine applications such as the Space Tug and embodies features directed toward optimization of vehicle performance. A configuration selection was conducted based on prior Air Force Contracts, and additional criteria for optimum stage performance. Following configuration selection, analyses and design of the major components and engine systems were conducted to sufficient depth to provide layout drawings suitable for subsequent detailing. In addition, engine packaging to a common interface and a retractable nozzle concept were defined. Alternative development plans and related costs were also established. The design embodies high-performance, low-weight, low NPSH requirements (saturated propellant inlet conditions at start), idle-mode operation, and autogenous pressurization. The design is the result of the significant past and current LO2/LH2 technology efforts of the NASA centers and the Air Force, as well as company-funded programs. Author

N74-16490*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLIGHT INVESTIGATION OF INSTALLATION EFFECTS ON A PLUG NOZZLE WITH A SERIES OF BOATTAILED PRIMARY SHROUDS INSTALLED ON AN UNDERWING NACELLE
Verlon L. Head Washington Feb. 1974 31 p refs

(NASA-TM-X-2983; E-7612) Avail: NTIS HC $3.00 CSCL 21E

Several variations of a boattailed shroud for a 10 deg conical plug nozzle were tested using an F-106B aircraft for Mach 0.6 to 1.3. The data were obtained so that the tradeoff between boattail and plug size could be studied for an underwing nacelle location. The nozzles were tested with J85-GE-13 turbojet engine, and the data were compared to previous flight results of installed plug nozzles. Boattail area varied from 31 to 66 percent of the nacelle area. The effect of increasing projected boattail area was to increase the gross thrust coefficient in the same way as from isolated data for flight Mach numbers below 0.85. The highest gross thrust coefficient (0.958) was obtained at Mach 0.95 with a long circular arc shroud configuration with a very small amount of secondary air flow. Author

N74-16491*# General Electric Co., Cincinnati, Ohio.
EXPERIMENTAL INVESTIGATION OF A 4 AND 1/2 STAGE TURBINE WITH VERY HIGH STAGE LOADING FACTOR. 2: TURBINE PERFORMANCE
N. D. Walker and M. W. Thomas Washington NASA Feb. 1974 95 p refs
(Contract NAS3-15322)
(NASA-CR-2363; R73AEG163) Avail: NTIS HC $3.75 CSCL 21E

The experimental test program results of a 4 1/2-stage turbine with a very high stage loading factor are presented. A four-stage turbine was tested with and without outlet turning vanes. The 4 1/2-stage turbine achieved a design point total-to-total efficiency of 0.853. The outlet turning vane design point performance was 0.4 percent of the overall 4 1/2-stage turbine efficiency. Tests were conducted at various levels of Reynolds number and indicated decreases in turbine efficiency and equivalent weight flow with decreasing Reynolds number.
Author

N74-16492*# Aerophysics Research Corp., Bellevue, Wash.
PROGRAM USER'S MANUAL FOR OPTIMIZING THE DESIGN OF A LIQUID OR GASEOUS PROPELLANT ROCKET ENGINE WITH THE AUTOMATED COMBUSTOR DESIGN CODE AUTOCOM
R. H. Reichel, D. S. Hague, R. T. Jones, and C. R. Glatt Washington NASA Dec. 1973 283 p refs
(Contract NAS3-13331)
(NASA-CR-2293) Avail: NTIS HC $6.50 CSCL 21H

This computer program manual describes in two parts the automated combustor design optimization code AUTOCOM. The program code is written in the FORTRAN 4 language. The input data setup and the program outputs are described, and a sample engine case is discussed. The program structure and programming techniques are also described, along with AUTOCOM program analysis. Author

N74-16493*# General Electric Co., Cincinnati, Ohio. Flight Propulsion Div.
HYDROGEN-METHANE FUEL CONTROL SYSTEMS FOR TURBOJET ENGINES Final Report
J. S. Goldsmith and G. W. Bennett Oct. 1973 162 p refs
(Contract NAS3-14319)
(NASA-CR-121247; R74AEG153; TM-73-489) Avail: NTIS HC $10.25 CSCL 21E

Design, development, and test of a fuel conditioning and control system utilizing liquid methane (natural gas) and liquid hydrogen fuels for operation of a J85 jet engine were performed. The experimental program evaluated the stability and response of an engine fuel control employing liquid pumping of cryogenic fuels, gasification of the fuels at supercritical pressure, and gaseous metering and control. Acceptably stable and responsive control of the engine was demonstrated throughout the sea level power range for liquid gas fuel and up to 88 percent engine speed using liquid hydrogen fuel. Author

N74-16494*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TERMINAL-SHOCK AND RESTART CONTROL OF A MACH 2.5, AXISYMMETRIC, MIXED COMPRESSION INLET WITH 40 PERCENT INTERNAL CONTRACTION
Robert J. Baumbick Washington Feb. 1974 21 p refs
(NASA-TM-X-2992; E-7688) Avail: NTIS HC $2.75 CSCL 21E

Results of experimental tests conducted on a supersonic, mixed-compression, axisymmetric inlet are presented. The inlet is designed for operation at Mach 2.5 with a turbofan engine (TF-30). The inlet was coupled to either a choked orifice plate or a long duct which had a variable-area choked exit plug. Closed-loop frequency responses of selected diffuser static pressures used in the terminal-shock control system are presented. Results are shown for Mach 2.5 conditions with the inlet coupled to either the choked orifice plate or the long duct. Inlet unstart-restart traces are also presented. High-response inlet bypass doors were used to generate an internal disturbance and also to achieve terminal-shock control. Author

N74-16495*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
LOW-SPEED WIND-TUNNEL INVESTIGATION OF THE AERODYNAMIC AND ACOUSTIC PERFORMANCE OF A TRANSLATING GRID CHOKED FLOW INLET
John M. Abbott, Brent A. Miller, and Richard L. Golladay Washington Feb. 1974 33 p refs
(NASA-TM-X-2966; E-7562) Avail: NTIS HC $3.00 CSCL 21E

The aerodynamic and acoustic performance of a translating grid choked-flow inlet was determined in a low-speed wind tunnel at free-stream velocities of 24, 32, and 45 m/sec and incidence angles of 0, 10, 20, 30, 35, 40, 45, and 50 deg. The inlet was sized to fit a 13.97- centimeter-diameter fan with a design weight flow of 2.49 kg/sec. Measurements were made to determine inlet total pressure recovery, flow distortion, and sound pressure level for both choked and unchoked geometries over a range of inlet weight flows. For the unchoked geometry, inlet total pressure recovery ranged from 0.983 to 0.989 at incidence angles less than 40 deg. At 40 deg incidence angle, inlet cowl separation was encountered which resulted in lower values of pressure recovery and higher levels of fan broadband noise. For the choked geometry, increasing total pressure losses occurred with increasing inlet weight flow that prevented the inlet from reaching full choked conditions with the particular fan used. These losses were attributed to the high Mach number drag rise characteristics of airfoil grid. At maximum attainable inlet weight flow, the total pressure recovery at static conditions was 0.935. The fan blade passing frequency and other fan generated pure tones were eliminated from the noise spectrum, but the broadband level was increased. Author

N74-16496*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
EXPLORATORY TESTS OF TWO STRUT FUEL INJECTORS FOR SUPERSONIC COMBUSTION
Griffin Y. Anderson and Paul B. Gooderum Washington Feb. 1974 47 p refs
(NASA-TN-D-7581; L-9428) Avail: NTIS HC $3.00 CSCL 21E

Results of supersonic mixing and combustion tests performed with two simple strut injector configurations, one with parallel injectors and one with perpendicular injectors, are presented and analyzed. Good agreement is obtained between static pressure measured on the duct wall downstream of the strut injectors and distributions obtained from one-dimensional calculations. Measured duct heat load agrees with results of the one-dimensional calculations for moderate amounts of reaction, but is underestimated when large separated regions occur near the injection location. For the parallel injection strut, good agreement is obtained between the shape of the injected fuel distribution inferred from gas sample measurements at the duct exit and the distribution calculated with a multiple-jet mixing theory. The overall fraction of injected fuel reacted in the multiple-jet calculation closely matches the amount of fuel reaction necessary to match static pressure with the one-dimensional calculation. Gas sample measurements with the perpendicular injection strut also give results consistent with the amount of fuel reaction in the one-dimensional calculation. Author

N74-16497*# Nielsen Engineering and Research, Inc., Mountain View, Calif.
A STUDY OF INGESTION AND DISPERSION OF ENGINE

EXHAUST PRODUCTS IN TRAILING VORTEX SYSTEMS
Jack N. Nielsen, Stephen S. Stahara, and James P. Woolley
Nov. 1973 135 p refs
(Contract NAS2-7337)
(NASA-CR-114721; NEAR-TR-54) Avail: NTIS HC $8.75 CSCL 21E

Analysis has been made of the ingestion and dispersion of engine exhaust products into the trailing vortex system of supersonic aircraft flying in the stratosphere. The rate of mixing between the supersonic jet and the co-flowing supersonic stream was found to be an order of magnitude less than would be expected on the basis of subsonic eddy-viscosity results. The length of the potential core was 66 nozzle exit radii so that the exhaust gases remain at elevated temperatures and concentrations over much longer distances than previsously estimated. Ingestion started at the end of the potential core and all hot gas from the engine was ingested into the trailing vortex within two core lengths. Comparison between the buoyancy calculations for the supersonic case with nondimensionalized subsonic aircraft contrail data on wake spreading showed good agreement. Velocity and temperature profiles have been specified at various stages of the wake, and the analysis in this report can be used to predict variations of concentrations of species such as nitrogen oxides under conditions of chemical reaction. Author

N74-16498# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
ANALYSIS OF THE PROBLEMS POSED BY THE DEVELOPMENT AND USE OF LOW THRUST ELECTRIC DEVICES
M. Y. Chipouze and C. Landrault 1973 25 p refs Presented at the 24th Intern. Astronautical Congr., Baku, 7-13 Oct. 1973 Sponsored by CNES
Avail: NTIS HC $3.25

A survey of electric propulsion systems for geostationary satellite stabilization is presented. The main thrustor parameters are reviewed and mission requirements are analyzed. The following types of thrustors are considered: electrostatic thrustors (electron bombardment in thrustor, contact ion thrustor, colloid thrustor), and electromagnetic thrustors (pulsed plasma thrustor). Static and dynamic mathematical models of a cesium contact ionization thrustor are defined, and the definition and realization of the power conditioning and control unit are detailed. ESRO

N74-16499# Energy Research Corp., Bethel, Conn.
SILICON CARBIDE RADIAL TURBINE INVESTIGATION Final Report, Dec. 1971 - Jun. 1973
R. E. Engdahl, E. S. Tillman, Jr., J. E. Motherway, and B. S. Baker Sep. 1973 44 p refs
(Contract DAAK02-72-C-0166)
(AD-769070; ERC-0189F) Avail: NTIS CSCL 21/5

The report describes the experimental and theoretical efforts to fabricate a small radial ceramic turbine wheel by the chemical vapor deposition (CVD) of silicon carbide (SiC). The CVD process and the fabrication of SiC wheels in tungsten mold is described. A lower cost process for producing graphite molds is also presented. Although certain aspects of the SiC wheel fabrication were shown to be feasible, a complete intact structure was not successfully made. Design aspects of the ceramic wheel including stress and thermal analysis are presented along with suggested mounting procedures. Recommendations for future work are also made. Author (GRA)

N74-16500# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.
AN ANALYTICAL ANALYSIS OF THE EFFECTS OF INSTANTANEOUS VORTICITY ON COMPRESSOR PERFORMANCE M.S. Thesis
James Edward Shoemaker Jun. 1973 89 p refs
(AD-769415) Avail: NTIS CSCL 21/5

Vorticity forms the basis for a new approach to the analysis of inlet distortion in axial flow fans and compressors. Farmer first formulated this approach and this paper represents a test of the usefulness of his theory. A summary of recent developments in the field along with a discussion of the effects of distortion on stall margin forms a background for this complex problem. A computer program calculates the vorticity pattern at the compressor face using data that are read from a magnetic tape. The data, which were provided by NASA Lewis Research Center in Cleveland, consist of eleven stall events. The output of the program contains tables of stagnation pressure and the partial derivatives of pressure and the partial derivatives of pressure in the R and theta directions as well as three maps. The three maps are of pressure and radial and circumferential vorticity. The results of the program show a correlation between a ring of large positive circumferential vorticity and stall, leading to the conclusion that the stall was caused by the increase in blade loading induced by the vorticity. This conclusion suggests a formulation for a universal inlet distortion index and provides a basis for the evaluation of the vorticity approach to the problem. Author (GRA)

N74-16501# Naval Postgraduate School, Monterey, Calif.
INVESTIGATIONS INTO THE VARIATION OF THE INTERNAL BALLISTICS OF A SOLID FUEL RAMJET THROUGH COMBUSTOR DESIGN M.S. Thesis
Charles Ernest Jones, III Sep. 1973 77 p refs
(AD-769747) Avail: NTIS CSCL 21/5

An experimental investigation of the internal ballistics of solid fuel ramjets was conducted in order to more adequately define the pertinent variables in combustor design. The experimental investigation included the effects of wall mass addition on the recirculation zone of a rearward facing step combustor design, various methods of combustor flame stabilization, and the effects of inlet turbulence on the internal ballistics of the combustor. Flow conditions within the recirculation zone were unaffected by varying rates of wall mass addition. Swirl devices and centerbodies were found to be inadequate substitutes for the rearward facing step inlet. The solid fuel ramjet combustor was found to be highly susceptible to inlet turbulence. (Modified author abstract) GRA

N74-16502# Office of the Assistant for Study Support, Kirtland AFB, N.Mex.
APPLICABILITY OF ELECTRIC PROPULSION FOR FUTURE MILITARY SATELLITES Final Report
Calvin W. Thomas and Wendell M. Adamson Sep. 1973 183 p refs
(AF Proj. 63101F)
(AD-769521; OAS-TR-73-4) Avail: NTIS CSCL 21/3

The feasibility of using electric propulsion subsystems to perform conventional propulsion functions in mission areas of Air Force interest is investigated. Consideration is given to using electric propulsion either alone or in conjunction with conventional propulsion subsystems. In each case, the results are compared with the conventional propulsion subsystem that otherwise would be used. The analysis identifies some areas wherein the application of electric propulsion would result in substantial cost savings, but the study also indicates other areas in which the applications of electric propulsion is not cost effective for the missions under consideration in this study.
Author (GRA)

N74-16503# Air Force Aero Propulsion Lab., Wright-Patterson AFB, Ohio.
THE USE OF STREAM THRUST CONCEPTS FOR THE APPROXIMATE EVALUATION OF HYPERSONIC RAMJET ENGINE PERFORMANCE Technical Report, Aug. - Sep. 1963
Edward T. Curran and Roger R. Craig Jul. 1973 56 p refs
(AF Proj. 3012)
(AD-769481; AFAPL-TR-73-38) Avail: NTIS CSCL 21/5

A simplified method of estimating the performance of supersonic combustion ramjet engines is presented. The method utilizes stream thrust concepts and enables valid performance estimates to be made without the aid of a computer program, only a few simple graphs are required. A new reference stream thrust quantity is defined and shown to be of value in estimating engine flight performance. The data given in this report enable performance estimates to be made for hydrogen fueled engines operating stoichiometrically for speeds in excess of about Mach 8. Author (GRA)

N74-16504# ARO, Inc., Arnold Air Force Station, Tenn.
EXPERIMENTAL VERIFICATION OF A TECHNIQUE FOR TESTING FULL-SCALE INLET/ENGINE SYSTEMS AT

ANGLES OF ATTACK UP TO 20 DEG AT TRANSONIC SPEEDS Final Report, 1 Jul. 1972 - 30 Jun. 1973
R. L. Palko AEDC Oct. 1973 64 p refs
(ARO Proj. PF218)
(AD-769307; ARO-PWT-TR-73-117; AEDC-TR-73-169) Avail: NTIS CSCL 21/5

A study was conducted to demonstrate experimentally the capability of a new flow-shaping technique to extend the full-scale inlet/engine testing limit of the AEDC 16-Ft Transonic Wind Tunnel. Simulation was accomplished up to 20-deg angle of attack using a pair of modified hollow cylinder, flow-shaping devices and a 1/16-scale inlet model in the AEDC 1-Ft Transonic Wind Tunnel. This is an increase of 8 deg in pitch over the present geometric pitch limit of 12 deg. Inlet ramp and lip pressure data were used to verify the technique supported by Mach numbers measured in front of the inlet, pressures measured at the the engine-face station, and inlet dynamic total-pressure data. The Mach number covered by the study was from 0.6 to 1.1.
Author (GRA)

N74-16505# Army Coating and Chemical Lab., Aberdeen Proving Ground, Md.
A PREDICTIVE STUDY OF THE OCCURRENCE OF METEOROLOGICAL CONDITIONS CONTRIBUTING TO AUTOMOTIVE CARBURETOR ICING Final Report
John P. Doner Sep. 1973 56 p refs
(DA Proj. 1T6-62611-A-106)
(AD-769593; CCL-3006) Avail: NTIS CSCL 21/7

Meteorological conditions contributing to automotive carburetor icing were examined for 3 first order weather stations located in the continental U.S. and Alaska. Automotive carburetor icing, resulting in poor warm-up and stalling, occurs due to several factors; namely, critical engine and carburetor design, fuel volatility, and the occurrence of specific meteorological conditions. For this study the frequency of the simultaneous occurrence of an air temperature between 35 to 45F and a relative humidity greater than 74 percent was determined for each hour of the day at each weather station. The highest hourly percent occurrences are displayed in isopleth maps for each month, with their intended application for defining geographical regions where automotive carburetor icing is likely to occur. Author (GRA)

N74-15964 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL STUDY OF A MODEL OF A HYDRO-GAS RAMJET ENGINE
N. A. Prikhodko *In its* Turbulent Flow in Flexible Pipes and Ramjet Engines (JPRS-60785) 14 Dec. 1973 p 8-20 refs Transl. into ENGLISH from Gidromekhan. (Kiev), no. 24, 1973 p 65-73 (For availability see N74-15962 07-12)

N74-15965 Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL INVESTIGATION OF A MODEL OF A HYDRO-GAS RAMJET ENGINE WITH FORCING OF THRUST BY BALLASTING
Yu. G. Mokeyev *In its* Turbulent Flow in Flexible Pipes and Ramjet Engines (JPRS-60785) 14 Dec. 1973 p 21-26 ref Transl. into ENGLISH from Gidromekhan. (Kiev), no. 24, 1973 p 73-77 (For availability see N74-15962 07-12)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N74-16506 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
METEOROLOGICAL DATA. VOLUME 99, NO 3: EVALUATION OF INFRARED RADIATION MEASUREMENTS BY HIGH RESOLUTION NIMBUS AND ITOS RADIOMETERS (HRIR, THIR, SR) [METEOROLOGISCHE ABHANDLUNGEN. BAND 99, HEFT 3: AUSWERTUNG VON INFRAROT-STRAHLUNGSMESSUNGEN DER HOCHAUFLOESEN NIMBUS- UND ITOS-RADIOMETER (HRIR, THIR, SR)]
Gunild Schenk 1973 163 p refs In GERMAN; ENGLISH summary
Avail: Issuing Activity

Radiation experiments are presented of the high resolution infrared radiometer of Nimbus and ITOS satellites as well as several important aspects with regard to the evaluation of the radiation measurements. A survey on the technical functions is given of the different types of radiometer (high resolution infrared radiometer (HRIR), temperature humidity-infrared radiometer (THIR) and scanning radiometer (SR)) and contains a description of the technical modification of an APT-Ground Station for the reception of Infrared Radiation data in the DRIR-mode. Based on the technical and theoretical assumptions of radiation measurements a contribution to the evaluation of IR-data of the high resolution radiometers is included. Several interesting problems in connection with IR-measurements are discussed. These are: distances and resolution in the IR-photos, manual gridding techniques, possible sources of errors influencing the evaluation of the data, and some results of the meteorological interpretation of the Nimbus and ITOS radiation data. Author

N74-16507 California Inst. of Tech., Pasadena.
POLARIZATION OBSERVATIONS OF 3C RADIO SOURCES AND GALACTIC FARADAY ROTATION Ph.D. Thesis
William Edwin Wright 1973 175 p
Avail: Univ. Microfilms Order No. 73-26479

The linear polarization properties of 206 radio sources from the 3CR catalogue were measured, in most cases at 21, 18 and 6 cm. The observing also allowed the establishment of upper limits for the degree of circular polarization. The Faraday rotation measurements of 354 radio sources, mostly extragalactic, were computed with careful attention to ambiguities and uncertainties; a novel quality grading system was employed. These rotation measures constitute a powerful probe of the magnetic field structure and electron density of the local spiral arm. If the electrons in the local regions of the galaxy form a disk 200 pc in thickness and 2 kpc in radius, then there is a uniform, linear component of the galactic field. Dissert. Abstr.

N74-16508 Denver Univ., Colo.
SOLAR ACTIVITY AND THE MODULATION OF GALACTIC COSMIC RADIATION Ph.D. Thesis
Gary Douglas Parker 1973 127 p
Avail: Univ. Microfilms Order No. 73-30003

Indices of solar flares, calcium plages, sunspots, decimeter radio noise, the electron corona at 2 and 8 arcmin above the limb, and the nucleonic cosmic ray flux are cross-correlated to investigate the relationship between solar activity and long term modulation. All data cover the years 1964 to 1967, inclusive. It is concluded that peaks in the brightness of the white light corona at 8 arcmin above the solar limb represent coronal cones of avoidance. Located over solar active centers, these cones are regions of the corona where the escape of hot plasma into the solar wind is impeded by strong magnetic fields. Fast solar wind from regions of diverging magnetic field lines emanates outside of active regions. Solar wind plasma moves radially away from the sun, and because of solar rotation, the fast wind upstream from the cone of avoidance overtakes the slower wind in the cone. Tangential discontinuities and shock fronts that form near the compression at the interface between the two streams sweep cosmic rays out of the inner solar system. Dissert. Abstr.

N74-16509 Stanford Univ., Calif.
THERMALLY DRIVEN MASS FLOWS IN THE CONVECTION ZONE OF THE SUN Ph.D. Thesis
Geert Cornelis Dijkhuis 1973 118 p
Avail: Univ. Microfilms Order No. 73-30385

A formulation of the fluid dynamics of convective regions is developed which leads to an analytical description of the solar rotation, the Evershed flow, and the supergranulation. The starting point of the present formulation is the mixing length picture of convective equilibrium, but the earlier point mass model for convective molecules is replaced by a model with both inertia and intrinsic moment of inertia. This extension introduces three rotational degrees of freedom into the dynamics of individual convective molecules, which enter into the dynamical equations for a mixing length fluid in the form of a separate vector field which is termed the spin field. It is shown that for convective molecules having a spherically symmetric mass distribution the

spin field is proportional to the local vorticity; the proportionality factor is termed the spin parameter. The proposed dynamical equations for mixing length fluids contrast with conventional hydrodynamics. Dissert. Abstr.

N74-16510*# California Inst. of Tech., Pasadena.
A STUDY OF COSMIC-RAY POSITRON AND ELECTRON SPECTRA IN INTERPLANETARY AND INTERSTELLAR SPACE AND THE SOLAR MODULATION OF COSMIC RAYS Ph.D. Thesis
Alan Coffman Cummings Mar. 1973 284 p refs
(Grants NGL-05-002-007; NGR-05-002-160)
(NASA-CR-136772; SRL-73-1) Avail: NTIS HC $16.25 CSCL 04A

The differential energy spectra of cosmic-ray positrons and negatrons with energies between approximately 11 and 1500 MeV was measured during the period 1968-1971 using a balloon-borne magnetic spectrometer. These measurements fill a gap in the previously existing data and permit the determination of the interstellar spectra of cosmic-ray positrons and electrons. Knowledge of these spectra provides a crucial tool for studies of the distribution and density of matter and magnetic fields in the interstellar medium and the origin and dynamics of energetic particles contained in the fields. The differential energy spectrum of interstellar electrons may be represented as a power-law, j alpha T to the -1.8 power for 100 MeV approximately < T approximately < 2 GeV, but must flatten considerably at lower energies. From the measured electron charge composition, it is concluded that the majority of cosmic-ray electrons with energies above approximately 10 MeV originate in primary sources. Author

N74-16511# Physical Research Lab., Ahmedabad (India).
SIZE SPECTRA OF EXTENSIVE AIR SHOWERS AND PRIMARY COSMIC RAY SPECTRUM
Y. C. Saxena [1973] 7 p refs
(CR-73-02) Avail: NTIS HC $3.00

Results on the size spectra of the extensive air showers, in the size range 100,000 < N < 10 to the 7th power, recorded with two different triggering requirements are presented. The difference in the power indices of two spectra indicates a functional relation between the number of muons of energy greater than 150 GeV and the shower size. The expression for the primary cosmic ray spectrum is given. The spectrum compares well with the spectrum obtained in other experiments, and confirms the existence of a change in the logarithmic slope in the neighborhood of 10 to the 15th power eV. Author

N74-16512# Hydrometeorological Publishing House, Leningrad (USSR).
SOLAR RADIATION AND RADIATION BALANCE DATA (THE WORLD NETWORK): ANNUAL DATA, 1964 - 1968
T. G. Berliand, ed. 1970 600 p In ENGLISH and RUSSIAN
Avail: NTIS HC $32.00

A reference guide of global radiation and radiation balance data is presented for Africa, Asia, South America, North America, Southwest Pacific, and Europe. Tables presented include: monthly and annual values of global radiation, monthly annual values of radiation balance, hourly values of global radiation, and hourly values of radiation balance. F.O.S.

N74-16513# Little (Arthur D.), Inc., Cambridge, Mass. Engineering Sciences
ENERGY CONSERVATION WITH SOLAR CLIMATE CONTROL
Peter E. Glaser 14 Nov. 1973 9 p Presented to Subcomm. on Energy of the Comm. on Sci. and Astronaut., US House of Representatives, Washington, 14 Nov. 1973
Avail: NTIS HC $3.00

The use of solar energy for climate control is discussed, with emphasis on solar heating and cooling of buildings. Government/industry relations are discussed in terms of taking action and supplying the market for solar climate control systems. The components of these systems are listed. K.M.M.

N74-16514# Little (Arthur D.), Inc., Cambridge, Mass.
A NEW VIEW OF SOLAR ENERGY
Peter E. Glaser and James E. Murphy 1971 12 p refs Presented at Intersoc. Energy Conversion Eng. Conf., Boston, 3-6 Aug. 1971
Avail: NTIS HC $3.00

The use of solar energy as a comprehensive national energy policy is discussed in terms of its social, economic, and environmental effects. Also considered are the nature of solar energy, practical considerations, and research needs. K.M.M.

N74-16515*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEASUREMENT OF COSMIC RAY POSITRON AND NEGATRON SPECTRA BETWEEN 50 AND 800 MeV Ph.D. Thesis
Joseph Kenneth Daugherty Jan. 1974 207 p refs
(Grant NGL-21-002-033)
(NASA-TM-X-70580; X-660-74-16) Avail: NTIS HC $12.50 CSCL 03B

A balloon-borne magnetic spectrometer was used to measure the spectra of cosmic ray positrons and negatrons at energies between 50 and 800 MeV. Comparisons of the separate positron and negatron spectra observed near the earth with their expected intensities in interstellar space can be used to investigate the complex (and variable) interaction of galactic cosmic rays with the expanding solar wind. The present measurements, which have established finite values or upper limits for the positron and negatron spectral between 50 and 800 MeV, have confirmed earlier evidence for the existence of a dominant component of negatrons from primary sources in the galaxy. The present results are shown to be consistent with the hypothesis that the positron component is in fact mainly attributable to collisions between cosmic ray nuclei and the interstellar gas. The estimate of the absolute intensities confirm the indications from neutron monitors that in 1972 the interplanetary cosmic ray intensities were already recovering toward their high levels observed in 1965. Author

N74-16516*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OBSERVATIONS OF INTERACTIONS BETWEEN INTERPLANETARY AND GEOMAGNETIC FIELDS
J. L. Burch Dec. 1973 76 p refs Submitted for publication
(NASA-TM-X-70576; X-646-73-390) Avail: NTIS HC $6.00 CSCL 03B

Magnetospheric effects associated with variations of the north-south component of the interplanetary magnetic field are examined in light of recent recent experimental and theoretical results. Although the occurrence of magnetospheric substorms is statistically related to periods of southward interplanetary magnetic field, the details of the interaction are not understood. In particular, attempts to separate effects resulting directly from the interaction between the interplanetary and geomagnetic fields from those associated with substorms have produced conflicting results. The transfer of magnetic flux from the dayside to the nightside magnetosphere is evidenced by equatorward motion of the polar cusp and increases of the magnetic energy density in the lobes of the geomagnetic tail. The formation of a macroscopic X-type neutral line at tail distances less than 35 R sub E appears to be a substorm phenomenon. Author

N74-16517# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
HELIUM AN HEAVY IONS IN THE SOLAR WIND
V. Formisano and G. Moreno Nov. 1971 130 p refs Submitted for publication
(LPS-71-27) Avail: NTIS HC $8.50

The behavior of helium ions and heavier ions in the expanding solar corona and in the solar wind, based on recent observations and on theoretical models, is discussed. Helium and other elements abundant in the solar atmosphere were found to be 6 to 8% and 10 to 20%, respectively. The Nakada and the Geiss expansion models of the solar corona are reviewed. Alpha particle observations are discussed, notably number density, bulk velocity, temperature distribution, and velocity distribution function. Helium enrichment in the interplanetary plasma was studied, together with proton bulk velocity discontinuities, and shock waves. Finally, observation of other ions in the solar wind, using electrostatic

analyzer experiments and Apollo 11 and 12 experiments, is dealt with. ESRO

N74-16518# Consiglio Nazionale delle Ricerche, Rome (Italy). Lab. di Ricerca e Tecnologia per lo Studio del Plasma nello Spazio.
FORBUSH DECREASES AND INTERPLANETARY DISTURBANCES
A. M. Conforto Mar. 1973 26 p refs
(LPS-73-9) Avail: NTIS HC $3.50

The correlation between perturbations of the interplanetary medium and Forbush decrease events was studied using interplanetary magnetic field and cosmic ray data for the period March to November 1968. Attempts were made to detect the particular mechanism responsible for this type of modulation of the cosmic ray intensity. It was found that the major and more unequivocal Forbush-like events are associated with interplanetary discontinuities of the hydromagnetic shock wave type. Also, the decreasing stage of a Forbush decrease takes place entirely while the perturbed region sweeps over the earth. Finally, irregularities of a scale size comparable to the gyroradius of approximately 10 GeV/c rigidity cosmic ray particles are enhanced in the perturbed regions; the Forbush decrease amplitude is possibly related to the amount of field fluctuations. Author (ESRO)

N74-16519# European Space Research and Technology Center, Noordwijk (Netherlands).
EXPERIMENT E1, INCORPORATED IN PAYLOAD C78: DESCRIPTION OF THE CIRCUITS USED FOR MEASURING ELECTRON FLUX [EXPERIENCE E1 PLACEE SUR LA CHARGE UTILE C 78. DESCRIPTION DES CIRCUITS UTILISES POUR LA MESURE DES FLUX D'ELECTRONS]
J. Henrion Paris ESRO Aug. 1973 25 p refs In FRENCH; ENGLISH summary
(ESRO-TN-89-ESTEC) Avail: NTIS HC $3.25

Experiment E1, mounted on board payload C78 for measuring charged auroral particles, consists of three distinct parts which measure: (1) electrons between 0.5 and 20 keV; (2) electrons higher than 15 and 40 keV; and (3) protons from 0.5 to 44 MeV, and alpha particles from 6 to 75 MeV. For the first two parts of the experiment, a description of the detectors used is followed by an analysis of the associated electron circuits. The system of information selection and transmission is described, and its limitations are discussed. Possible improvements are considered. Author (ESRO)

N74-16520# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DEVICE FOR RECORDING DATA FROM A SOLAR MAGNETOGRAPH AND THE DATA INPUT TO A COMPUTER
S. C. Bormnik, L. V. Granitskii, and B. F. Oask 9 Oct. 1973 10 p refs Transl. into ENGLISH from Novaya Tekh. Astron. (USSR), no. 4, 1972 p 41-45
(FTD Proj. T74-01-20)
(AD-769053; FSTC-HT-23-296-74) Avail: NTIS CSCL 03/2

The report describes specially developed piece of equipment for the digital recording of data from a three-component solar magnetograph and for its computer input and control of the magnetograph. GRA

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N74-16521 Texas Univ., Austin.
THE ESTIMATION OF THE STATE AND THE UNMODELLED ATMOSPHERIC DRAG FOR NEAR EARTH SATELLITES Ph.D. Thesis
Atair Rios Neto 1973 185 p
Avail: Univ. Microfilms Order No. 73-26071

A study, conceiving the estimation of near earth satellite orbits under the influence of drag by processing observations from topocentric tracking stations is presented. The equations of motion are linearized about a reference trajectory and a linear unbiased minimum variance estimator is used sequentially to process the observations. In order to avoid divergence, due to dynamical model errors and the nonlinearity of the actual system, a dynamical model compensation technique which allows the estimation of the unmodelled accelerations is used. The atmospheric resistance and the satellite motion around its center of mass are treated as unmodelled effects. The procedure is evaluated by a computer simulation where the Jacchia's atmospheric model is used to simulate the nature of all variations in the atmosphere. The estimate of the position and velocity obtained by the dynamical model compensation method, is shown to be significantly improved over th. estimate obtained with classic minimum variance estimation methods. Dissert. Abstr.

N74-16522 Pittsburgh Univ., Pa.
AN INVESTIGATION OF FACTORS WHICH AFFECT THE INTERNAL PRECISION OF ASTROMETRIC MEASURES MADE WITH THE THAW PHOTOGRAPHIC REFRACTORS OF THE ALLEGHENY OBSERVATORY Ph.D. Thesis
Karl Walter Kamper, Jr. 1973 329 p
Avail: Univ. Microfilms Order No. 73-27161

Three main lines of approach to the problem of locating and then reducing the internal errors of Allegheny astrometric observations were taken. First, the Thaw refractor was thoroughly tested optically for the first time since 1916. Then the optical test results were combined with information on the properties of photographic plates to estimate, a priori, the magnitude of error sources. Lastly, some 720 parallaxes were analyzed statistically to examine the error sources a posteriori. The optical tests showed the telescope objective to be basically good with small zonal errors and essentially no coma. However, its present state of adjustment is poor and the image quality is consequently degraded. Thermal variations introduce large amounts of spherical aberration. Rotation of the lenses in their cell has increased the axial astigmatism. Improper longitudinal stops cause an axial decentering coma that varies with zenith distance.
Dissert. Abstr.

N74-16523 Texas Univ., Austin.
METHODS OF ORBIT COMPUTATION WITH MULTIREVOLUTION STEPS Ph.D. Thesis
Otis Frederick Graf, Jr. 1973 227 p
Avail: Univ. Microfilms Order No. 73-26010

Multirevolution integration methods are developed which allow for many revolutions to be skipped in the computation of orbits. It is shown that multirevolution integration methods provide accurate trajectories for long intervals of time. These methods utilize the numerical solution of difference equations that result from an estimate of the change of the orbital elements during one revolution. The standard multi-step and single-step algorithms can integrate exactly difference equations which are polynomials. However, in orbital mechanics the solutions of the difference equations are characterized by periodic terms. A new algorithm is presented that will integrate exactly products of ordinary and Fourier polynomials. Error estimates are given. The methods are applied to several problems of orbital mechanics.
Dissert. Abstr.

N74-16524 Colorado State Univ., Fort Collins.
VARIABILITY OF PLANETARY BOUNDARY LAYER WINDS Ph.D. Thesis
Lee Ray Hoxit 1973 182 p
Avail: Univ. Microfilms Order No. 73-29043

Systematic stratifications and analyses of low level radiosonde and rawinsonde data are performed for portions of the eastern half of the United States. These procedures are designed to specify the changes in the planetary boundary layer wind profile resulting from variations in baroclinicity, stability, and speed. The observed changes are used to develop an empirical model of the height distribution of the ageostropic wind. In baroclinic conditions the angle between the winds and isobars; the ageostrophic wind components; the surface stress and the surface wind speed are all shown to be functions of the orientation of the thermal wind vector relative to the surface geostrophic wind. Observed diurnal variations in the wind profiles for the lowest 2.5-3 km are associated with the typical diurnal variation in

stability. The results indicate that the normalized ageostrophic wind components change significantly as the speed increases, especially in the layer 25 to 150 mb above the surface.
Dissert. Abstr.

N74-16525 Stanford Univ., Calif.
SEISMIC WAVE VELOCITIES IN UNCONSOLIDATED MATERIALS AND SOME LUNAR IMPLICATIONS Ph.D. Thesis
Pradeep Talwani 1973 122 p
Avail: Univ. Microfilms Order No. 73-30484

After the initial seismic investigations of the moon, the compressional wave velocity was found to increase from about 100 m/sec at the lunar surface to nearly 6 km/sec at a depth of 25 km. Compaction of a powdered rock under its own weight was offered as a possible explanation. The object of the experimental study was to test this hypothesis, and also to study the changes in the elastic properties of unconsolidated materials subjected to large confining pressures. The pulse transmission method was employed to obtain the compressional wave velocity in silica sand and both compressional and shear wave velocities in volcanic ash and powdered basalt. In addition to these velocities, the experiments enabled the simultaneous bulk density values during pressure cycling to be determined. From these observations the corresponding values of porosity and various elastic moduli were calculated. Results reveal that large variations in both compressional and shear wave velocity values are completely reversible on pressure cycling.
Dissert. Abstr.

N74-16526 Columbia Univ., New York.
LUNAR SEISMICITY, STRUCTURE, AND TECTONICS Ph.D. Thesis
David Raymond Lammlein 1973 96 p
Avail: Univ. Microfilms Order No. 73-28477

Natural seismic events are detected by the long period seismometers at Apollo seismic stations 16, 14, 15, and 12 at annual rates of 3300, 1700, 800, and 700, respectively. Peaks in the total lunar seismic activity are observed at 13 to 14 day intervals. Repetitive moonquakes from forty-one hypocenters produce seismograms characteristic of each hypocenter which match throughout the wavetrain. Signals from these and numerous other less active hypocenters account for about 90% of the long-period-signals detected by the lunar seismic stations. Meteoroid impact signals account for the remainder. Moonquakes at each hypocenter occur only within an active period of a few days duration at a characteristic phase of the monthly lunar tidal cycle. Moonquakes from nearly equal numbers of hypocenters are observed at opposite phases of the monthly cycle, accounting for the 14 day peaks in total lunar seismic activity. The number of quakes at each hypocenter in a single active period range from none to four.
Dissert. Abstr.

N74-16527*# Chicago Univ., Ill. Div. of Biological Sciences.
HIGH VOLTAGE ELECTRON MICROSCOPY OF LUNAR SAMPLES Final Report
H. Fernandez-Moran 21 Aug. 1973 16 p refs
(Grant NGR-14-001-166)
(NASA-CR-136782) Avail: NTIS HC $3.00 CSCL 03B

Lunar pyroxenes from Apollo 11, 12, 14, and 15 were investigated. The iron-rich and magnesium-rich pyroxene specimens were crushed to a grain size of ca. 50 microns and studied by a combination of X-ray and electron diffraction, electron microscopy, 57 Fe Mossbauer spectroscopy and X-ray crystallography techniques. Highly ordered, uniform electron-dense bands, corresponding to exsolution lamellae, with average widths of ca. 230A to 1000A dependent on the source specimen were observed. These were separated by wider, less-dense interband spacings with average widths of ca. 330A to 3100A. In heating experiments, splitting of the dense bands into finer structures, leading finally to obliteration of the exsolution lamellae was recorded. The extensive exsolution is evidence for significantly slower cooling rates, or possibly annealing, at temperatures in the subsolidus range, adding evidence that annealing of rock from the surface of the moon took place at ca. 600 C. Correlation of the band structure with magnetic ordering at low temperatures and iron clustering within the bands was studied.
Author

N74-16528# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
A PROCEDURE FOR AUTOMATIC EVALUATION OF STELLAR PASSAGE OBSERVATIONS BY THE CIRCUMZENITHAL VUGTK-CSSR [EIN VERFAHREN ZUR AUTOMATISCHEN AUSWERTUNG VON STERNDURCHGANGSBEOBACHUNGEN MIT DEM CIRCUMZENITAL VUGTK-CSSR]
Siegfried Heitz and Hellmut Walter 1973 25 p refs In GERMAN; ENGLISH summary
(Rept-196) Avail: NTIS HC $3.25

The procedures developed for the observation and the extensive automatic evaluation of observations obtained with the circumzenithal VUGTK-CSSR are described. During the observation of stars a reference frequency of 1000 Hz from a quarz clock is recorded on one trace of a magnetic tape and the impulses of the contacts of the impersonal micrometer and those of the comparisons with the clock and the time signals are recorded on a second trace of the tape. The digitalization of the tape record for the further full automatic evaluation is carried out by a special electronic counter.
Author

N74-16529# Lowell Observatory, Flagstaff, Ariz.
PHOTOELECTRIC UBV MAGNITUDES OF 119 PROPER MOTION STARS AND SUSPECTED WHITE DWARFS
Kjell Bern and Stig Wramdemark 15 Aug. 1973 7 p refs
(Bull-161) Avail: NTIS HC $3.00

Results of photoelectric UBV photometry of 119 stars are presented. The stars are taken either from the Lowell Proper Motion Survey or from the byproduct of this, the lists of suspected white dwarfs.
Author

N74-16530# National Aerospace Lab., Tokyo (Japan).
THE STUDY ON THE MOTION OF AN ARTIFICIAL SATELLITE IN THE EARTH'S GRAVITATIONAL FIELD: IN THE CASE OF THE LONG MANEUVER OF FREE ORBITAL MOTION
Sumio Takeuchi 1973 19 p refs In JAPANESE; ENGLISH summary
(NAL-TR-320) Avail: NTIS HC $3.00

The motion of an artificial satellite in the gravitational field of the earth is investigated using Lagrange's planetary equations. The complete gravitational disturbing function expressed in osculating Keplerian orbital elements is used. Analytic formulae for the first order perturbations of the Keplerian orbital elements are derived. In the case of satellites with periods commensurate with the earth's rotation period, by introducing the critical argument, the variations of orbital elements due to resonance terms are obtained. Then, integrating the resonance equation, the limits of the critical argument of the satellite are determined. The theory is applied to the orbit of the geostationary satellite and variations of orbital elements are calculated. Further, the stability of the satellite orbits in an earth-fixed reference frame is examined.
Author

N74-16531*# Linguistic Systems, Inc., Cambridge, Mass.
RENDEZVOUS IN SPACE
V. G. Blakhontsev, V. A. Ivanov, and V. I. Shabanov Washington NASA Jan. 1974 263 p Transl. into ENGLISH of the book "Sblizheniye v Kosmose" Moscow, Mil. Press of the Min. of Defense, 1973 p 3-240
(Contract NASw-2482)
(NASA-TT-F-15185) Avail: NTIS HC $15.25 CSCL 22A

The theoretical principles of the dynamics of rendezvous of spacecraft are described, as well as several problems involving the movement of cosmonauts in deep space. The equations of the relative motion in various systems of coordinates are discussed and methods are presented for calculating the rendezvous trajectories in the stages of long-range and short-range guidance. In the case of the short-range stage, methods of guidance are analyzed in detail, both with and without the use of the laws of orbital motion. The problem of the need for developing special devices for moving around in deep space, and possible types of such devices as well as the characteristics of their movement are discussed. The data are intended for engineers specializing in the field of space technology.
Author

N74-16532# Joint Publications Research Service, Arlington, Va.

PRELIMINARY RESULTS OF STUDYING THE PLASMA NEAR THE MOON

M. B. Vasilyev, A. S. Vyshlov, M. A. Kolosov, N. A. Savich, V. A. Samovol, L. N. Samoznayev, A. I. Sidorenko, and D. Ya. Shtern 9 Jan. 1974 7 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 22, no. 1, 1973 p 67-70

(JPRS-60945) Avail: NTIS HC $3.00

An examination was made of studies on the integral characteristics of a plasma near the moon. The data were obtained by instruments onboard the Lunar 19 station with the ground receiving station recording the amplitudes and the electron concentration along the communications line. Author

N74-16533*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LUNAR SURFACE CHEMICAL COMPOSITION IN THE REGION OF THE ACTIVITY OF LUNOKHOD-2

G. Ye. Kocharev and S. B. Viktorov Washington Jan. 1974 9 p refs Transl. into ENGLISH of "Khimicheskiy Sostov Lunnoy Poverkhnosti v Rayone Raboty Lunokhoda-2", Acad. of Sci. USSR, Phys.-Tech. Inst., Leningrad, Preprint no. 447, 1973 10 p

(NASA-TT-F-15360; Preprint-447) Avail: NTIS HC $3.00 CSCL 03B

Results of investigations carried out by means of spectometer RIFMA-M give evidence for the discovery of gradual changes of the lunar surface chemical composition in the transit zone, mare-highland. This took place along the route of Lunokhod-2 on the bottom of Crater Le Monnier, in the highland region and in a zone of tectonic fracturing. Author

N74-16534*# Techtran Corp., Glen Burnie, Md.

FROM SPACECRAFT TO SPACECRAFT

Washington NASA Jan. 1974 7 p Transl. into ENGLISH from Aviats. i Kosmonavt. (Moscow), Oct. 1973 p 30-31

(Contract NASw-2485)

(NASA-TT-F-15361) Avail: NTIS HC $3.00 CSCL 22A

The problems are considered in transferring cosmonauts to and Soyuz and Apollo spacecraft, which have different atmospheres. The Soyuz atmosphere is composed of 20 to 30% oxygen, and 70 to 80% nitrogen at a pressure of 760 mm Hg, while the atmosphere of the Apollo is pure oxygen at 260 mm Hg. It is suggested that prior to transfer, the pressure of the Soyuz be decreased to 0.7 atmosphere and the oxygen content be increased to 40%, while the pressure of the Apollo be increased. The avoidance of decompression disorders is discussed. F.O.S.

N74-16535# Joint Publications Research Service, Arlington, Va.

SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 316

14 Jan. 1974 89 p Transl. into ENGLISH from Russian reports

(JPRS-60984) Avail: NTIS HC $6.50

Translations and abstracts are presented of articles on meteorology, oceanography, upper atmosphere and space research, astronomy, and terrestrial geophysics, covering both science news and formal scientific reports. Author

N74-16536*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.

TITAN ATMOSPHERE MODELS, 1973

Neil Divine 1 Feb. 1974 38 p refs

(Contract NAS7-100)

(NASA-CR-136694; JPL-TM-33-672) Avail: NTIS HC $4.00 CSCL 03B

The composition and structure of the atmosphere of Titan, based on theory and on spectroscopic and infrared data, is reviewed for the development of numerical engineering models. Light, nominal, and heavy atmospheres are described and tabulated, and their profiles of radius, temperature, pressure, and density are illustrated. Corresponding descriptions of atmospheric dynamics, condensates and surfaces are outlined. Author

N74-16537*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

INCLUSION OF KNOWN INTEGRALS IN THE OPTIMAL TRAJECTORY PROBLEM

Rowland E. Burns Washington Feb. 1974 21 p refs

(NASA-TN-D-7592; M-125) Avail: NTIS HC $2.75 CSCL 22C

The classical problem of determination of the rocket trajectory which minimizes mass expenditure during motion between two points in the field of a single gravitating body is analyzed. The known integrals of the system are incorporated into the adjoint equations resulting in a reduction from a seventh-order adjoint system to a third-order adjoint system. The first case which is treated in that of planar motion under specific end conditions. In this case a regularization of the recently derived equations is achieved. The general three-dimensional case is also reduced from a seventh-order adjoint system to a third-order adjoint system. In this case a regularization has not been found. Author

N74-16538*# Analytical Mechanics Associates, Inc., Los Angeles, Calif.

PROGRAMMER'S MANUAL FOR THE MISSION ANALYSIS EVALUATION AND SPACE TRAJECTORY OPERATIONS PROGRAM (MAESTRO)

David Lutzky and William S. Bjorkman Mar. 1973 485 p

(Contract NAS5-11900)

(NASA-CR-132910) Avail: NTIS HC $26.25 CSCL 22C

The Mission Analysis Evaluation and Space Trajectory Operations program known as MAESTRO is described. MAESTRO is an all FORTRAN, block style, computer program designed to perform various mission control tasks. This manual is a guide to MAESTRO, providing individuals the capability of modifying the program to suit their needs. Descriptions are presented of each of the subroutines descriptions consist of input/output description, theory, subroutine description, and a flow chart where applicable. The programmer's manual also contains a detailed description of the common blocks, a subroutine cross reference map, and a general description of the program structure. Author

N74-16539*# Analytical Mechanics Associates, Inc., Los Angeles, Calif.

USER'S GUIDE TO THE MISSION ANALYSIS EVALUATION AND SPACE TRAJECTORY OPERATIONS PROGRAM (MAESTRO)

David Lutzky and James Schafer Mar. 1973 96 p refs

(Contract NAS5-11900)

(NASA-CR-132912; Rept-73-9) Avail: NTIS HC $7.00 CSCL 22C

The MAESTRO system is a mission analysis tool designed to present to the user information necessary to make the various decisions required in the design and execution of a spaceflight mission. The system was designed so that it can be used in both the pre-launch mission planning phase of a mission and during the flight as an in-flight decision making tool. A description of each of the following modes is presented: (1) trajectory propagation mode; (2) retro-fire determination mode; (3) midcourse analysis determination mode; (4) Monte Carlo mode; (5) verification mode; (6) orbit stability mode; and (7) post injection trim mode. A description of the inputs necessary to run the program mode is given along with a sample case. Author

N74-16540# Hale Observatories, Pasadena, Calif.

ANNUAL REPORT OF THE DIRECTOR OF HALE OBSERVATORIES, 1972 - 1973

Horace W. Babcock 1973 68 p refs

Avail: NTIS HC $5.50

A description is given of the activities and observations at the Hale Observatories. Topics include: observing conditions; physics of the sun; solar system studies; stellar spectroscopy and photometry; stellar chromospheres; variable stars; infrared sources; X-ray sources; supernovae; galaxies; quasars; instrumentation; and the 100-inch du Pont Telescope. K.M.M.

N74-16541*# Analytical Mechanics Associates, Inc., Mountain View, Calif.

PARAMETER ESTIMATION SUPPLEMENT TO THE MISSION ANALYSIS EVALUATION AND SPACE TRAJECTORY OPERATIONS PROGRAM (MAESTRO)

William S. Bjorkman and Chauncey W. Uphoff Aug. 1973 99 p refs

(Contract NAS5-11900)

(NASA-CR-132908; Rept-73-48) Avail: NTIS HC $7.00 CSCL

22C

This Parameter Estimation Supplement describes the PEST computer program and gives instructions for its use in determination of lunar gravitation field coefficients. PEST was developed for use in the RAE-B lunar orbiting mission as a means of lunar field recovery. The observations processed by PEST are short-arc osculating orbital elements. These observations are the end product of an orbit determination process obtained with another program. PEST's end product it a set of harmonic coefficients to be used in long-term prediction of the lunar orbit. PEST employs some novel techniques in its estimation process, notably a square batch estimator and linear variational equations in the orbital elements (both osculating and mean) for measurement sensitivities. The program's capabilities are described, and operating instructions and input/output examples are given. PEST utilizes MAESTRO routines for its trajectory propagation. PEST's program structure and subroutines which are not common to MAESTRO are described. Some of the theoretical background information for the estimation process, and a derivation of linear variational equations for the Method 7 elements are included.

Author

N74-16542*# Smithsonian Astrophysical Observatory, Cambridge, Mass.

RADIATION PRESSURE AND AIR DRAG EFFECTS ON THE ORBIT OF THE BALLOON SATELLITE 1963 30D

Jack W. Slowey 18 Jan. 1974 102 p refs

(Grant NGR-09-015-002)

(NASA-CR-136794; SAO-Special-Rept-356; SAO-310-050) Avail: NTIS HC $7.25 CSCL 01B

Computed orbits of the balloon satellite 1963 30D are given every 2 days over an interval of 456 days near the beginning of the satellite's lifetime and an interval of 824 days near the end of its lifetime. The effects of radiation pressure on the satellite are examined in some detail. It is found that the variations in all the elements can be represented by use of a single parameter to specify the effect of diffuse reflection from the satellite's surface, and that this parameter remains constant, or nearly so, during the entire 7-year lifetime. Success in obtaining a consistent representation of the radiation-pressure effects is ascribed to the inclusion of the effects of terrestrial radiation pressure, using a model for the earth's albedo that includes seasonal and latitudinal variations. Anomalous effects in the orbital acceleration, as well as in the other elements, are represented quite well by including a small force at right angle to the solar direction and by allowing this to rotate about the solar direction. This implies that the satellite is aspherical, that it is rotating, and that the axis of rotation precesses.

Author

N74-16543# Analytical and Computational Mathematics, Zurich (Switzerland).

NUMERICAL ORBIT COMPUTATION BASED ON A CANONICAL INTERMEDIATE ORBIT

G. Scheifele Sep. 1973 60 p refs

(Contract ESOC-490/72-AR)

(ESRO-CR(P)-318) Avail: NTIS HC $5.00

Delaunay-similar (DS) elements were studied using the true anomaly as independent variable. In addition to the 6 classical elements comes the true anomaly as a canonical angular variable and its conjugate, essentially the perturbing energy. This set of 8 elements obeys a system of trivial linear differential equations in the two-body case, and the equation dt/ds = r sup 2 no longer has to be integrated. Instead, a time element 1, which is also canonical variable, is introduced. The physical time is then obtained by evaluating an elementary transformation equation. The system of DS elements was numerically integrated for various perturbation. For obleteness-type perturbations, the results achieved over many revolutions appear to be superior to any obtained from known systems of differential equations. ESRO

N74-16544# European Space Operations Center, Darmstadt (West Germany).

THE SHORT PERIODIC LUNI-SOLAR PERTURBATION OF THE MOTION OF A HIGHLY ECCENTRIC ORBIT SATELLITE

E. A. Roth Paris ESRO Dec. 1971 23 p refs

(ESRO-SR-18-ESOC) Avail: NTIS HC $3.25

A method for the calculation of short periodic as well as long periodic and secular luni-solar perturbations acting on a satellite is demonstrated. The orbit is supposed to be non-equatorial and of medium to high eccentricity. Emphasis is put on a method which allows an easy, and as far as possible algorithmic, application on a computer. The perturbing function is expanded to the third order and the motion of the perturbing bodies is taken into account. The stroboscopic method suggested provides a solution valid for many revolutions and allows the easy consideration of other pertubations (oblateness, airdrag) whereby the coupling terms are obtained implicitly. The integrals needed are determined recursively. The solution given is of primary interest for the orbit determination of satellites by differential correction or similar methods. It can also be applied to calculate the medium and long term evolution of the orbital elements.

Author (ESRO)

N74-16545# Osservatorio Astronomico, Rome (Italy).

SOLAR PHENOMENA Monthly Bulletin, Sep. 1973

Massimo Cimino Sep. 1973 13 p

(Bull-185) Avail: NTIS HC $3.00

Solar data for September 1973 are presented. For complete abstract, see N00-00BAD.

N74-16546# Arizona Univ., Tucson.

GROUNDBASED INFRARED MEASUREMENTS Final Report, 14 Aug. 1969 - 31 May 1973

Frank J. Low 5 Jun. 1973 27 p refs

(Contract F19628-70-C-0046; ARPA Order 1366; AF Proj. 5130)

(AD-768620; AFCRL-TR-73-0371) Avail: NTIS CSCL 03/2

The report describes the results of a groundbased sky survey at 10 micrometers, an attempt to verify and study previously unknown sources detected by the AFCRL HI STAR rocket survey, and the results of an absolute calibration of stellar fluxes.

Author (GRA)

N74-16547# Chalmers Univ. of Technology, Goteborg (Sweden). Research Lab. of Electronics.

ON A TRANSIENT OH GROUND STATE SOURCE IN W75B

J. Ellder 1973 12 p refs

(PB-224135/4GA; RR-116) Avail: NTIS HC $3.00 CSCL 03B

In June and July 1971 a transient OH source was observed in W75B at 1667 MHz (+ 27 km/s) with the 84-foot telescope of the Onsala Space Observatory. Further measurements on the different OH ground and excited states were made during the years 1971 and 1972. No emissions, at velocities near 27 km/s, were detected at frequencies other than 1667 MHz. In April to August 1972, another transient emission was detected at 28.5 km/s and in December 1972 at 25.5 km/s in the 1667 MHz line of OH. As before, it only appeared when the right circular polarization filter was used.

Author (GRA)

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also; 28 Propulsion Systems; and 32 Structural Mechanics.

N74-16548*# North American Rockwell Corp., Downey, Calif. Space Div.

METHODS OF ASSESSING STRUCTURAL INTEGRITY FOR SPACE SHUTTLE VEHICLES Phase 2 Report

R. E. Anderson and F. H. Stuckenberg Jan. 1971 224 p refs

(Contract NAS10-7250)

(NASA-CR-136773; SD-71-112) Avail: NTIS HC $13.25 CSCL 22B

A detailed description and evaluation of nondestructive evaluation (NDE) methods are given which have application to space shuttle vehicles. Appropriate NDE design data is presented in twelve specifications in an appendix. Recommendations for NDE development work for the space shuttle program are presented.

Author

N74-16549*# Aerospace Corp., El Segundo, Calif.
OPERATIONS ANALYSIS (STUDY 2.6). VOLUME 3: PAYLOAD DESIGNS FOR SPACE SERVICING
M. G. Wolfe 15 Sep. 1973 201 p refs
(Contract NASw-2472)
(NASA-CR-136601; ATR-74(7336)-3-Vol-3) Avail: NTIS CSCL 22B

Payload design and operational modes were studied to reduce payload costs for the space shuttle. Three potential operational loads were considered. These are the launch vehicle, types of payload design, and the mode of operation. Mission selection for space servicing, and EOS design are discussed along with mission equipment modules, and space-servicing policies. F.O.S.

N74-16550*# Kanner (Leo) Associates, Redwood City, Calif.
THE SOVIET SPACE SHUTTLE
R. Hofstaetter Washington NASA Jan. 1974 11 p Transl. into ENGLISH from Flug-Rev. Int. (West Germany), no. 1, 1974 3 p
(Contract NASw-2481)
(NASA-TT-F-15283) Avail: NTIS HC $3.00 CSCL 22A

A two-stage space shuttle is described which consists of two lifting bodies placed horizontally, one above the other: a launch vehicle as a carrier vehicle, and an upper vehicle designed to carry the freight, or passengers. The mission profile, and the space transport system concepts are discussed. F.O.S.

N74-16551# Communications Satellite Corp., Washington, D.C.
COMSAT AT 10: THE FIRST DECADE OF THE COMMUNICATIONS SATELLITE CORPORATION
1 Feb. 1973 62 p Original contains color illustrations
Avail: NTIS HC $5.25

A chronology of the COMSAT program and the Intelsat satellite operation is presented. Operational satellites provide global coverage for a network of earth stations in forty-nine countries. The system provides much of the world's trans-oceanic telephone and record communications, as well as a capability for global television transmissions. The organizational structure, technological accomplishments, and examples of global communication accomplishments are provided. P.N.F.

N74-16552*# Auburn Univ., Ala. Guidance and Control Study Group.
SOME OPTIMAL CONSIDERATIONS IN ATTITUDE CONTROL SYSTEMS
Joseph S. Boland, III 14 Sep. 1973 103 p refs
(Contract NAS8-26580)
(NASA-CR-120133; TR-3) Avail: NTIS HC $7.25 CSCL 22B

The conventional six-engine reaction control jet relay attitude control law with deadband is shown to be a good linear approximation to a weighted time-fuel optimal control law. Techniques for evaluating the value of the relative weighting between time and fuel for a particular relay control law is studied along with techniques to interrelate other parameters for the two control laws. Vehicle attitude control laws employing control moment gyros are then investigated. Steering laws obtained from the expression for the reaction torque of the gyro configuration are compared to a total optimal attitude control law that is derived from optimal linear regulator theory. This total optimal attitude control law has computational disadvantages in the solving of the matrix Riccati equation. Several computational algorithms for solving the matrix Riccati equation are investigated with respect to accuracy, computational storage requirements, and computational speed. Author

N74-16553*# Auburn Univ., Ala. Guidance and Control Study Group.
DESIGN IMPLEMENTATION IN MODEL-REFERENCE ADAPTIVE SYSTEMS
Joseph S. Boland, III 14 Sep. 1973 212 p refs
(Contract NAS8-26580)
(NASA-CR-120132; TR-5) Avail: NTIS HC $12.75 CSCL 22B

The derivation of an approximate error characteristic equation describing the transient system error response is given, along with a procedure for selecting adaptive gain parameters so as to relate to the transient error response. A detailed example of the application and implementation of these methods for a space shuttle type vehicle is included. An extension of the characteristic equation technique is used to provide an estimate of the magnitude of the maximum system error and an estimate of the time of occurrence of this maximum after a plant parameter disturbance. Techniques for relaxing certain stability requirements and the conditions under which this can be done and still guarantee asymptotic stability of the system error are discussed. Such conditions are possible because the Lyapunov methods used in the stability derivation allow for overconstraining a problem in the process of insuring stability. Author

N74-16554*# Chrysler Corp., New Orleans, La. Data Management Services.
MISALIGNMENT STUDIES ON SPACE SHUTTLE INTEGRATED VEHICLE (IA31FC)
P. Ramsey (NASA. Marshall Space Flight Center), T. McMeans (Northrup Services, Inc., Huntsville, Ala.), and T. Davis (Northrup Services, Inc., Huntsville, Ala.) Dec. 1973 243 p refs
(Contract NAS9-13247)
(NASA-CR-134072; DMS-DR-2072) Avail: NTIS HC $14.25 CSCL 22B

The effects of test model element misalignments on test results were investigated. Transonic wind tunnel-573 was designed to study these misalignment effects in detail by purposely misaligning model elements a known amount. Misalignments in TWT-573 were achieved by use of special off-set spacers and mounting hardware to change, yaw, pitch and roll on various elements of a 0.004-Scale PRR Baseline space shuttle configuration model. By comparing the misalignment runs to the nominal configuration with no misalignment, relative effects of the misalignment could be seen. This data was obtained over a Mach range of .9 to 1.46 using an angle of attack sweep of minus 10 deg to plus 10 deg in 2 deg increments. Author

N74-16555*# Chrysler Corp., New Orleans, La. Data Management Services.
RESULTS OF TESTS OA12 AND IA9 IN THE AMES RESEARCH CENTER UNITARY PLAN WIND TUNNELS ON AN 0.030-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 2A TO DETERMINE AERODYNAMIC LOADS. VOLUME 9
R. H. Spangler (Rockwell Intern.) Oct. 1973 1294 p refs 18 Vol.
(Contract NAS9-13247)
(NASA-CR-128794-Vol-9; DMS-DR-2032-Vol-9) Avail: NTIS HC $66.75 CSCL 22B

Tests were conducted in the NASA/ARC Unitary Plan wind tunnels on an 0.030-scale replica of the space shuttle vehicle configuration 2A. Aerodynamic loads data were obtained at Mach numbers from 0.6 to 3.5. The investigation included Tests IA9A, B and C on the integrated (launch) configuration and Tests OA12A and C on the isolated orbiter (entry configuration). The integrated vehicle was tested at angles of attack and sideslip from minus 8 degrees to + 8 degrees. The isolated orbiter was tested at angles of attack from minus 15 degrees to + 40 degrees and angles of sideslip from minus 10 degrees to + 10 degrees as dictated by trajectory considerations. The effects of orbiter/external tank incidence angle and deflected control surfaces on aerodynamic loads were also investigated. Author

N74-16556*# Chrysler Corp., New Orleans, La. Data Management Services.
RESULTS OF TESTS OA12 AND IA9 IN THE AMES RESEARCH CENTER UNITARY PLAN WIND TUNNELS ON AN 0.030-SCALE MODEL OF THE SPACE SHUTTLE VEHICLE 2A TO DETERMINE AERODYNAMIC LOADS. VOLUME 10
R. H. Spangler (Rockwell Intern.) Oct. 1973 1159 p refs 18 Vol.
(Contract NAS9-13247)
(NASA-CR-128794-Vol-10; DMS-DR-2032-Vol-10) Avail: NTIS HC $59.00 CSCL 22B

For abstract, see N74-16555.

N74-16557# National Research Council of Canada, Ottawa (Ontario). Space Research Facilities Branch.

BLACK BRANT ROCKET APF-4B-26 LAUNCHED AT CHURCHILL RESEARCH RANGE, 0100, 17 MAY 1972
Sep. 1972 23 p ref
(SRFB-068) Avail: NTIS HC $3.25

The engineering aspects of preparing the payload and launching Black Brant rocket APF-IVB-26 at Churchill Research Range at 0100 CDT, 17 May 1972 are discussed. This vehicle was launched during quiet solar and geomagnetic conditions carrying experiments for the detection of galactic and cosmic soft X-rays. Vehicle performance was satisfactory, and data were obtained. Author

N74-16558*# Chrysler Corp., New Orleans, La. Data Management Services.
WIND TUNNEL TEST OF THE 0.010-SCALE SPACE SHUTTLE INTEGRATED VEHICLE IN THE NASA-AMES 3.5 FOOT HYPERSONIC WIND TUNNEL (IA10)
F. F. Fitzgerald (Rockwell Intern., Downey, Calif.), M. T. Petrozzi (Rockwell Intern., Downey, Calif.), J. W. Cleary (NASA. Ames Res. Center), and J. A. Mellenthin (NASA. Ames Res. Center) Dec. 1973 138 p
(Contract NAS9-13247)
(NASA-CR-128795; DMS-DR-2078) Avail: NTIS HC $9.00 CSCL 22B

Experimental aerodynamic investigations were conducted in the NASA Ames Research Center 3.5-Foot Hypersonic Wind Tunnel on a 0.010-scale model of the space shuttle vehicle orbiter and external tank (model no. 32 OT). The purpose of the test was to evaluate the basic hypersonic stability characteristics of the external tank and orbiter and to define orbiter plume effects on aero characteristics using solid plumes. The test was conducted at angles of attack from minus 10 deg to 30 deg and angles of sideslip of minus 10 deg thru 10 deg. Six component force data and static base pressures were recorded during the test. Author

N74-16559*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: DEVELOPMENT AND USE OF SPECIALIZED RADIO EQUIPMENT FOR APOLLO RECOVERY OPERATIONS
William A. Middleton and H. F. Breshears Washington Feb. 1974 13 p
(NASA-TN-D-7587; JSC-S-385) Avail: NTIS HC $2.75 CSCL 22B

New personal communications equipment was required for the Apollo Program recovery operations. Two new, small, personal radios were developed and used successfully in the Apollo recovery program. Author

N74-16560*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: COMMAND AND SERVICE MODULE COMMUNICATIONS SUBSYSTEM
Edward E. Lattier, Jr. Washington Feb. 1974 29 p refs
(NASA-TN-D-7585; JSC-S-367) Avail: NTIS HC $3.00 CSCL 22B

The development of spacecraft communications hardware from design to operation is described. Programs, requirements, specifications, and design approaches for a variety of functions (such as voice, telemetry, television, and antennas) are reviewed. Equipment environmental problems such as vibration, extreme temperature variation, and zero gravity are discussed. A review of the development of managerial techniques used in refining the roles of prime and subcontractors is included. The hardware test program is described in detail as it progressed from breadboard design to manned flight system evaluations. Finally, a series of actions is recommended to managers of similar projects to facilitate administration. Author

N74-16561*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
APOLLO EXPERIENCE REPORT: PROBLEM REPORTING AND CORRECTIVE ACTION SYSTEM
T. J. Adams Washington Feb. 1974 24 p
(NASA-TN-D-7586; JSC-S-384) Avail: NTIS HC $2.75 CSCL 22B

The Apollo spacecraft Problem Reporting and Corrective Action System is presented. The evolution from the early system to the present day system is described. The deficiencies and the actions taken to correct them are noted, as are management controls for both the contractor and NASA. Significant experience gained from the Apollo Problem Reporting and Corrective Action System that may be applicable to future manned spacecraft is presented. Author

N74-16562*# Auburn Univ., Ala. Engineering Experiment Station.
[MODEL-REFERENCE ATTITUDE CONTROL AND REACTION CONTROL JET ENGINE PLACEMENT FOR SPACE SHUTTLE] Final Report
Joseph S. Boland, III 15 Sep. 1973 11 p refs
(Contract NAS8-26580)
(NASA-CR-120131) Avail: NTIS HC $3.00 CSCL 22B

Analytical studies on the theoretical aspects of thrust vector control of large space vehicles were conducted. A system for attitude control of the space shuttle vehicle was developed. Major accomplishments of the project are: (1) investigation of a model-reference adaptive control scheme for controlling the space shuttle attitude and (2) determination of optimum placement of reaction control jet engines on space shuttles. Author

N74-16563# Centre National de la Recherche Scientifique, Toulouse (France). Lab. d'Automatique et d'Analyse des Systemes.
ANALYSIS AND DESIGN OF AN ATTITUDE CONTROL SYSTEM FOR NON-RIGID SATELLITES
D. Poelaert, A. Liegeois, and M. Dureigne 1973 29 p refs Presented at the Conf. on Gyrodyn., Louvain la Neuve, Belg., 3-5 Sep. 1973
Avail: NTIS HC $3.50

A design process for three axis attitude control systems of flexible satellites using a double gimballed momentum wheel is given. The mathematical model was derived using overall structure eigenmodes, which leads to uncoupled transfer functions. The effect of mode truncation is discussed through energy considerations and practical diagrams are given, relating the energy error to the satellite parameters. The design of a single-axis linear control law is presented. The control is optimal with respect to a quadratic criterion, which necessitates the knowledge of all the state variables. This can be done using an observer; the control system then takes the form of a compensator, the parameters of which are chosen according to practical criteria taking into account bandpass and noise properties. The problem of parameter uncertainties or a priori indetermination of the mechanical structure is discussed and a sensitivity study made. Author (ESRO)

N74-16564# Societe Nationale Industrielle Aerospatiale, Cannes (France). Div. Systemes Balistiques et Spatiaux.
STUDY ON CARBON FIBER REINFORCED PLASTICS FOR USE IN SATELLITE STRUCTURES, PHASE 1 Final Report, phase 1 [ETUDE SUR L'UTILISATION DE PLASTIQUES RENFORCES PAR FILAMENTS DE CARBONE DANS LES STRUCTURES DE SATELLITE RAPPORT FINAL PHASE 1]
Jube, Briens, Legeret, Louis, Martinez, and Urbain Jul. 1973 129 p In FRENCH
(Contract ESTEC-1736/72-PP)
(Doc-1952-CA/80; ESRO-CR(P)-319) Avail: NTIS HC $8.50

The application of carbon fiber reinforced plastics in satellite components was studied. Mechanical calculations on sandwich panels, cylindrical components, and molded pieces are given. ESRO

N74-16565# Societe Nationale Industrielle Aerospatiale, Cannes (France). Div. Systemes Balistiques et Spatiaux.
STUDY ON CARBON FIBER REINFORCED PLASTICS FOR USE IN SATELLITE STRUCTURES, PHASE 1 PREPARATION STUDY: MECHANICAL CALCULATIONS [ETUDE SUR L'UTILISATION DE PLASTIQUES RENFORCES PAR FILAMENTS DE CARBONE DANS LES STRUCTURES DE SATELLITE, PHASE 1. ETUDE PREPARATOIRE: CALCULS MECANIQUES]
Jul. 1973 23 p In FRENCH
(Contract ESTEC-1736/72-PP)
(Doc-1952-CA/80-Add-1; ESRO-CR(P)-320) Avail: NTIS

HC $3.25

The application of carbon fiber reinforced plastics in satellite structures was studied, and their mechanical, thermal, and electrical properties are reviewed. Satellite components include sandwich panels, cylindrical parts, and molded structures. Selection criteria for materials applied on satellites were drawn up. Realization studies on carbon fiber reinforced plastics were made. These plastics and traditional materials were compared. ESRO

N74-16566# Societe Nationale Industrielle Aerospatiale, Cannes (France). Div. Systemes Balistiques et Spatiaux.

STUDY ON CARBON FIBER REINFORCED PLASTICS FOR USE IN SATELLITE STRUCTURES, PHASE 1. PREPARATORY STUDY: THERMAL CALCULATIONS [ETUDE SUR L'UTILISATION DE PLASTIQUES RENFORCES PAR FILAMENTS DE CARBONE DANS LES STRUCTURES DE SATELLITE, PHASE 1. ETUDE PREPARATOIRE: CALCULS THERMIQUES]

Jul. 1973 16 p In FRENCH

(Contract ESTEC-1736/72-PP)

(Doc-1952-CA/80-Add-2; ESRO-CR(P)-321) Avail: NTIS HC $3.00

Thermal calculations for temperature levels reachable either with conventional materials or with carbon fiber reinforced plastics for the Cos-B satellite platform are given. It was found that the use of carbon fiber reinforced plastic supports presents no major problems. ESRO

N74-16567# European Space Research and Technology Center, Noordwijk (Netherlands).

THE HEOS 1 PROGRAMME. VOLUME 2: IN-ORBIT ASSESSMENT REPORT

G. H. Booth, comp. Paris ESRO Jul. 1973 151 p

(ESRO-TR-4-ESTEC) Avail: NTIS HC $9.75

An assessment is made of the performance of the various spacecraft systems including those belonging to the experiments - during the first six months in orbit of the HEOS I satellite. Among the aspects discussed are the orbit, telecommunication system, power supply sub-system performance, evaluation of attitude system, thermal control, housekeeping, and the scientific aims and experiments. In general the experiments did not encounter any major problems and no unexpected behavior of the spacecraft subsystems was observed. ESRO

N74-16568# European Space Research and Technology Center, Noordwijk (Netherlands).

DEVELOPMENT AND LAUNCH OF PAYLOADS S-77/1 AND 2 [MISE AU POINT ET LANCEMENT DES CHARGES UTILES S-77/ 1 ET 2]

V. Laurent Jul. 1973 42 p In FRENCH; ENGLISH summary

(ESRO-TM-154-ESTEC) Avail: NTIS HC $4.25

The project was the launching, with Skylark rockets, of two identical payloads each comprising: a main payload of three scientific experiments for studying auroral phenomena, and a pneumatic system which enables the ejection of a secondary 20-kg payload at an altitude of about 80 km and a speed of 20 m/s. The onboard equipment is described, along with launching and flight performances of both experiments. Author (ESRO)

N74-16569# Louvain Univ. (Belgium).

THE EFFECT OF NUTATION DAMPERS ON THE ATTITUDE STABILITY OF A TRIPLE-SPIN SATELLITE

David A. Johnson Paris ESRO Jun. 1973 71 p refs Sponsored by ESRO

(ESRO-SN-125) Avail: NTIS HC $5.75

The attitude stability is studied of a satellite consisting of three axisymmetrical bodies spinning at different rates about a common axis, each body containing a nutation damper moving parallel to the spin axis, thus introducing periodic coefficients into the equations of motion. The resolution of these equations is carried out by means of the asymptotic expansion method, thereby permitting a subsequent stability analysis. The analytical stability conditions resulting from this study are then tested by means of a numerical parameter analysis based on Floquet theory. Author (ESRO)

N74-16570# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

STATIC ELECTRICITY PHENOMENA INVOLVED IN THE EUROPA 2 F-11 LAUNCH

Joseph Taillet 1973 7 p refs Presented at the 13th European Space Symp., London, 25-27 Jun. 1973 Sponsored by ELDO

Avail: NTIS HC $3.00

The details of the inquiry and subsequent research that led to a full explanation of the F-11 launching incidents are presented. It is shown how the accumulation of small mistakes, none of which vital, and the lack of basic research on unusual but possible situations, can bring about the failure of very complicated systems such as space launchers. Author (ESRO)

N74-16571# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.

STOPWATCH OBSERVATIONS OF SATELLITES. AUGUST 1973

R. D. Eberst 18 Sep. 1973 29 p

(ROE-STS-159) Avail: NTIS HC $3.50

Stopwatch observations made at stations connected with the Section during August 1973 are listed in satellite launch and time order: 586 fully reduced observations of 118 satellites. Author (ESRO)

N74-16572# Royal Observatory, Edinburgh (Scotland). Satellite Tracking Section.

STOPWATCH OBSERVATIONS OF SATELLITES, SEPTEMBER 1973

R. D. Eberst 29 Oct. 1973 30 p

(ROE-STS-160) Avail: NTIS HC $3.50

Stopwatch observations made at stations during September 1973 are listed in satellite launch and time order: 544 fully reduced observations of 144 satellites. Author (ESRO)

N74-16573# European Space Research and Technology Center, Noordwijk (Netherlands).

DEVELOPMENT, LAUNCH AND IN-FLIGHT PERFORMANCE OF ESRO SOUNDING-ROCKET PAYLOADS. VOLUME 1: PAYLOADS LAUNCHED IN 1964-1965

Y. P. G. Guerin, comp. Nov. 1972 74 p Original contains color illustrations

(ESRO-SP-76) Avail: NTIS HC $5.75

The technical reports on the payloads carried by ESRO sounding rockets during the period stated are summarized. In a very condensed standard format, they describe successively: the scientific experiments making up the payload; the time schedule achieved for the construction and launch of the payload; the mechanical and electrical design of the payload and the outstanding events occurring during its integration; preparation on the range and launch history; the behavior of the payload and its in-flight operation. In most cases, experience acquired during the lifetime of the payload has made it possible to put forward recommendations on how to improve the quality of future payloads and how to attempt to improve their reliability.

Author (ESRO)

N74-16574# European Space Research and Technology Center, Noordwijk (Netherlands).

CONTAMINATION RISKS RAISED BY APOGES MOTORS AFTER BURNOUT

J. Dauphin and G. Premat Sep. 1973 16 p ref

(ESRO-TM-147-ESTEC) Avail: NTIS HC $3.00

Early in the GEOS project it was realized that the apogee motor was a potential source of contamination of spacecraft and experiments. In order to determine the extent and influence of the contamination, Materials Section, ESTEC, was requested to investigate the materials currently in use. Results are presented indicating the typical properties of these materials.

Author (ESRO)

N74-16575# European Space Research and Technology Center, Noordwijk (Netherlands).

SATELLITE SYSTEM CONSIDERATIONS IN THE SELECTION OF SOLAR ARRAY GENERATORS

E. Ashford and H. Lechte 1973 15 p refs Presented at the UNESCO Symp. the Sun in the Service of Mankind, Paris, 2-6 Jul. 1973

Avail: NTIS HC $3.00

Different types of arrays which presently exist or are under

development are described and the applicability of each to certain satellite types or missions is discussed. Certain interfaces which must be considered and defined during the process of selecting a solar array for a specific application are outlined.
Author (ESRO)

N74-16576# Army Missile Command, Redstone Arsenal, Ala.
AN ENGINEERING AND PROGRAMMING GUIDE FOR A SIX DEGREE OF FREEDOM, TERMINAL HOMING SIMULATION PROGRAM
R. F. Ball, W. W. Lee, Jr., and C. L. Lewis 10 Oct. 1973 488 p refs
(DA Proj. 1M2-62303-A-214)
(AD-769595; RG-TR-73-22) Avail: NTIS CSCL 16/2

The report documents an all-digital, six degree of freedom (6DOF) simulation program which provides a realistic method for the evaluation and analysis of a terminal homing weapons system. Missile hardware components, vehicle dynamics, environment descriptions, and target motion are simulated by identifiable program modules. In some cases (e.g., the Actuator and Autopilot modules), both high and low frequency models are available, allowing simulations to be tailored to user needs. Two gimballed seekers are modeled which null on the LOS vector to provide an initial signal for proportional navigation guidance. A number of print and plot output options provide versatility of data presentation. Author (GRA)

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N74-16577 Rensselaer Polytechnic Inst., Troy, N.Y.
A MODIFIED IMPLANT TEST FOR STUDYING DELAYED CRACKING Ph.D. Thesis
James M. Sawhill, Jr. 1973 166 p
Avail: Univ. Microfilms Order No. 73-27228

With the development of high-strength steels, hydrogen-induced cracking in weldments has become a serious problem, and to date, there is no one theory which explains this phenomenon. The implant test was modified in this investigation to improve the reproducibility of the notch location with respect to the weld metal interface. Subsequently, the cracking tendencies of both weld and base metals in the HY-80 and HY-130 systems were evaluated with the modified implant test. In addition, acoustical crack monitoring instrumentation was used to give information during the test concerning crack initiation and propagation. Some implant specimens were unloaded after the detection of the first acoustical signal to observe the location of crack initiation in metallographically prepared sections. Fractured implant specimens were sectioned and prepared metallographically to observe crack propagation behavior. In addition, the fracture surfaces of both HY-130 and E14018 weld metal implant specimens were studied in a scanning electron microscope.
Dissert. Abstr.

N74-16578 Texas Univ., Austin.
WAVE PROPAGATION IN A FIBER REINFORCED CYLINDER Ph.D. Thesis
Sheng Chi Wu 1973 81 p
Avail: Univ. Microfilms Order No. 73-26111

Solutions of steady-state and transient wave propagation along a fiber reinforced cylinder, using a continuum mixture theory, are presented. The theory has previously been shown to correctly predict the dispersion and impact response of real fiber reinforced composities for the case of plane waves. In the steady-state case, the governing linearized equations derived from the continuum mixture theory for a particular class of fiber reinforced material are used. The equations are then expressed in radially symmetric polar coordinates together with boundary conditions corresponding to an infinite circular cylinder with a stress-free surface. Assumption of a steady-state solution leads to a transcendental characteristic equation which can be solved numerically. Numerical solutions of the characteristic equation result in curves of phase velocity and group velocity as functions of wave number for the first three modes with various number of fibers inside the cylinder. Dissert. Abstr.

N74-16579 Cornell Univ., Ithaca, N.Y.
ANALYSIS OF ORTHOTROPIC HYPERBOLIC PARABOLOID SHELLS Ph.D. Thesis
Ajoy Kumar Banerjee 1973 182 p
Avail: Univ. Microfilms Order No. 73-28265

A method of analysis of orthotropic hyperbolic paraboloid shells supported on edge beams is presented. The behavior of thin-steel inverted umbrella type hypar was studied both analytically and experimentally. The differential equations governing the bending behavior of orthotropic shallow shells were derived using the three orthogonal displacements u, v and w. The boundary conditions and the shell differential equations were represented in the finite difference form and the resulting simultaneous equations were solved using the Gaussian elimination method. The deflection and stress predictions from the analysis compared favorably with test data. The analytical results confirmed the fact that the stress levels in all the structural elements are low; thus the hypar stiffness is the most important design consideration. The magnitude of the shear force Nxy which is important for the design of connections does exceed that obtained from the membrane analysis.
Dissert. Abstr.

N74-16580 North Carolina State Univ., Raleigh.
PROPAGATION OF TWO DIMENSIONAL STRESS WAVES IN CYLINDRICAL BARS Ph.D. Thesis
Hsi Lang Chang 1972 129 p
Avail: Univ. Microfilms Order No. 73-26742

A numerical scheme is developed for a system of first order hyperbolic PDEs which govern the motions of elastic/viscoplastic media. Solutions are constructed by means of a step-by-step procedure employing finite difference equations along the bicharacteristic curves. As examples of the use of the method, three types of stress wave propagation are examined: (1) elastic, (2) elastic sinusoidal waves in 6061-T6 aluminum, and (3) elastic/viscoplastic wave propagation in mild steel. Finally, (1) the effects of different boundary conditions, (2) the effects of radial motion, (3) internal phenomena due to wave interactions, (4) two-dimensional reflection from a free end, and (5) viscous effects on two-dimensional wave propagation are discussed.
Dissert. Abstr.

N74-16581 Nebraska Univ., Lincoln.
THERMALLY INDUCED VIBRATION OF LAMINATED COMPOSITE PLATES Ph.D. Thesis
Wen-Tsao Kao 1973 115 p
Avail: Univ. Microfilms Order No. 73-25454

The rectangular laminated composite plates which are simply supported and have their top surface exposed to rapid heating are investigated. The unsymmetrical cases are studied which included cross-ply plates and angle-ply plates. The governing equations for the transverse deflections of laminated composite plates under thermal loading are derived, and the simplified linear differential equations are solved by applying the principle of superposition. The solution is obtained by summing up both the static and the dynamic effects of the transverse deflection in the form of Fourier series. The expressions of natural frequency and stress distributions are also presented. The mathematical solution is presented for the orthotropic and laminated composite plates under rapid heating. Dissert. Abstr.

N74-16582 Ohio State Univ., Columbus.
CHARACTERISTICS OF PLASTIC INSTABILITY IN THE DIRECTION OF PURE SHEAR Ph.D. Thesis
Amiya Kumar Chakrabarti 1973 165 p
Avail: Univ. Microfilms Order No. 73-26783

A review of the concepts of plastic instability has indicated that the existing theories can be grouped into three categories: (1) localization of plastic flow (necking) through fluctuations in cross-sectional area (maximum load criterion), (2) failure in the uniqueness of the material's analytic plastic property and (3) instability arising from thermal or structural softening during the course of deformation. The above treatments are found to be

inadequate in some respect. The earlier treatments do not predict the onset of instability in the directions of pure shear, which requires a special material state designated as dynamic ideal plastic state. Under the above state, instabilities can be initiated by discontinuity of tangential velocity along the characteristic surfaces (surfaces of pure shear) as defined in continuum plasticity. The characteristics of such a state is that the flow stress of the material after a certain amount of plastic deformation remains unchanged (or decreases) with an increase in strain or strain rate. Dissert. Abstr.

N74-16583 Rensselaer Polytechnic Inst., Troy, N.Y.
FLEXURAL-TORSIONAL-LONGITUDINAL VIBRATION OF ROTORS WITH CONTINUOUSLY DISTRIBUTED PARAMETERS Ph.D. Thesis
John P. Veldman 1973 103 p
Avail: Univ. Microfilms Order No. 73-27239

The research presented in this dissertation consists of an analytical investigation of the flexural - torsional - longitudinal vibrations of rotors with continuously distributed parameters. Basic mechanics, kinematics, and the linear theory of elasticity are used to form the specific Lagrangian of the rotor. Hamilton's variational principle is then used to derive the four coupled partial differential equations of rotor motion. Next, a Galerkin orthogonalization is used to transform the coupled partial differential equations into an approximate set of coupled Mathieu equations which represent the motion of an unbalanced rotor with uniformly distributed mass, constant circular cross-section, and homogeneous boundary conditions at each end. The variational-perturbational Hsu method is used to investigate the dynamic stability of the parametrically excited flexural vibrations of this rotor. An expression is derived which indicates if instability does occur, and if it does occur, yields the boundaries of the region of dynamic instability associated with the parametrically excited flexural vibrations of the rotor. Dissert. Abstr.

N74-16584 Illinois Univ., Chicago.
FORMULATION AND SOLUTION OF NON-HOMOGENEOUS ANISOTROPIC CIRCULAR CYLINDRICAL SHELL THEORIES Ph.D. Thesis
Suk Wha Chung 1973 117 p
Avail: Univ. Microfilms Order No. 73-26563

The method of asymptotic integration of the exact three-dimensional elasticity equations is used to derive the first approximation theories, governing the asymmetric deformation of non-homogeneous anisotropic circular cylindrical shells. The analysis is valid for materials which are non-homogeneous to the extent that their mechanical properties are allowed to vary with thickness coordinate. The derivation of the shell theories is accomplished by first introducing the shell dimensions and as yet unspecified length scales via changes in the independent variables. Next, the stresses and displacements are expanded asymptotically in terms of a small geometric parameter. A choice of length scales is then made and corresponding to different combinations of these length scales, different squences of systems of differential equations are obtained. Dissert. Abstr.

N74-16585* Maryland Univ., College Park. Dept. of Mechanical Engineering.
ATTENUATION OF STRESS WAVES IN SINGLE AND MULTI-LAYERED STRUCTURES Final Report
Jackson C. S. Yang and C. Y. Tsui May 1972 201 p refs
(Grant NGR-21-002-292)
(NASA-CR-135920) Avail: NTIS HC $12.25 CSCL 20K

Analytical and experimental studies were made of the attenuation of the stress waves during passage through single and multilayer structures. The investigation included studies on elastic and plastic stress wave propagation in the composites and those on shock mitigating material characteristics such as dynamic stress-strain relations and energy absorbing properties. The results of the studies are applied to methods for reducing the stresses imposed on a spacecraft during planetary or ocean landings. Author

N74-16586*# Hamilton Standard, Windsor Locks, Conn.
IMPACT RESISTANCE OF SPAR-SHELL COMPOSITE FAN BLADES Final Report
J. Graff, L. Stoltze, and E. M. Varholak Jul. 1973 43 p
(Contract NAS3-16778)
(NASA-CR-134521; HSER-6241) Avail: NTIS HC $4.25 CSCL 20K

Composite spar-shell fan blades for a 1.83 meter (6 feet) diameter fan stage were fabricated and tested in a whirling arm facility to evaluate foreign object damage (FOD) resistance. The blades were made by adhesively bonding boron-epoxy shells on titanium spars and then adhesively bonding an Inconel 625 sheath on the leading edge. The rotating blades were individually tested at a tip speed of 800 feet per second. Impacting media used were gravel, rivets, bolt, nut, ice balls, simulated birds, and a real bird. Incidence angles were typical of those which might be experienced by STOL aircraft. The tests showed that blades of the design tested in this program have satisfactory impact resistance to small objects such as gravel, rivets, nuts, bolts, and two inch diameter ice balls. The blades suffered nominal damage when impacted with one-pound birds (9 to 10 ounce slice size). However, the shell was removed from the spar for a larger slice size. Author

N74-16587*# Structural Composites Industries, Inc., Azusa, Calif.
EVALUATION OF POLYIMIDE/GLASS FIBER COMPOSITES FOR CONSTRUCTION OF LIGHT WEIGHT PRESSURE VESSELS FOR CRYOGENIC PROPELLANTS
I. Petker and M. Segimoto Sep. 1973 140 p refs
(Contract NAS3-15551)
(NASA-CR-121139; SCI-7322) Avail: NTIS HC $9.00 CSCL 11D

The application of polyimide resin as a matrix for glass filament-wound thin metal-lined pressure vessels was studied over a temperature range of (minus) 320 to 600 F. Keramid 601 polyimide was found to perform quite well over the entire range of temperature. Hoop stress values of 425 ksi were determined at 75 F which is equivalent to epoxy resin in similar structures. At -320 and 600 F, 125 and 80% of this strength was retained. Thermal ageing at 500 F for up to 50 hours was studied with severe reduction in strength, but there is evidence that this reduction could be improved. Another polyimide resin studied was P10PA which was found to have processing characteristics inappropriate for filament-winding. NOL ring tensile and shear data was determined from both resins with S-glass. Pressure vessel design, fabrication and test procedures are described in detail. Author

N74-16588*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DYNAMIC ANALYSIS OF A SYSTEM OF HINGE-CONNECTED RIGID BODIES WITH NONRIGID APPENDAGES
Peter W. Likins 1 Feb. 1974 29 p refs
(Contract NAS7-100)
(NASA-CR-136627; JPL-TR-32-1576) Avail: NTIS HC $3.50 CSCL 20K

Equations of motion are derived for use in simulating a spacecraft or other complex electromechanical system amenable to idealization as a set of hinge-connected rigid bodies of tree topology, with rigid axisymmetric rotors and nonrigid appendages attached to each rigid body in the set. In conjunction with a previously published report on finite-element appendage vibration equations, this report provides a complete minimum-dimension formulation suitable for generic programming for digital computer numerical integration. Author

N74-16589# Pisa Univ. (Italy). Ist. di Impianti Nucleari.
VIBRATION CHARACTERISTICS OF COAXIALLY CYLINDRICAL SHELLS IMMERSED IN A FLUID [CARATTERISTICHE DI VIBRAZIONE DI GUSCI COASSIALI CILINDRICI IMMERSI IN UN FLUIDO]
C. Carmignani and E. Manfredi May 1972 40 p refs In ITALIAN
(Rept-1416) Avail: NTIS HC $4.00

The effect of the inner space fluid of a coaxial cylinder on the vibration characteristics of the immersed structure was investigated with emphasis on structures such as vessels, barrels, and reactor cores immersed in water. Transl. by F.O.S.

N74-16590# Pisa Univ. (Italy).
CALCULATION METHOD FOR THE STUDY OF CRACKED RIGID STRUCTURES [METODO DI CALCOLO PER LO STUDIO DI STRUTURE IRRIGIDITE FESSURATE]
F. A. Rossi and A. DelPuglia 1971 96 p refs In ITALIAN
(Rept-1418) Avail: NTIS HC $7.00

The determination of the tension in cracked, rigid, flat panels is discussed in terms of structural analysis based on the finite element method. The program is presented for numerical calculations for evaluating typical panels, using the IBM 7090. Results obtained with this analysis are compared to those obtained by other methods. Transl. by F.O.S.

N74-16591# Pisa Univ. (Italy).
SOME FATIGUE PHENOMENA IN RIGID AERONAUTICAL SHELLS [SU ALCUNI FENOMENI DI FATICA IN STRUTTURE AERONAUTICHE A GUSCIO IRRIGIDITE]
A. Salvetti, A. DelPuglia, and C. Casarosa [1973] 9 p refs In ITALIAN
(Rept-1442) Avail: NTIS HC $3.00

The results are reported of theoretical and experimental research on the structural behavior of fatigue in rigid shells. The effects of cyclic compressive loads on fatigue are discussed along with the fail-safe computations of panels to tensile loads. Transl. by F.O.S.

N74-16592*# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.
APPLICATION OF THE COLLISION-IMPARTED VELOCITY METHOD FOR ANALYZING THE RESPONSES OF CONTAINMENT AND DEFLECTOR STRUCTURES TO ENGINE ROTOR FRAGMENT IMPACT
Thomas P. Collins and Emmett A. Witmer Aug. 1973 250 p refs
(Grant NGR-22-009-339)
(NASA-CR-134494; ASRL-TR-154-8) Avail: NTIS HC $14.50 CSCL 20K

An approximate analysis, termed the Collision Imparted Velocity Method (CIVM), was employed for predicting the transient structural responses of containment rings or deflector rings which are subjected to impact from turbojet-engine rotor burst fragments. These 2-d structural rings may be initially circular or arbitrarily curved and may have either uniform or variable thickness; elastic, strain hardening, and strain rate material properties are accommodated. This approximate analysis utilizes kinetic energy and momentum conservation relations in order to predict the after-impact velocities of the fragment and the impacted ring segment. This information is then used in conjunction with a finite element structural response computation code to predict the transient, large deflection responses of the ring. Similarly, the equations of motion for each fragment are solved in small steps in time. Also, some comparisons of predictions with experimental data for fragment-impacted free containment rings are presented. Author

N74-16593# Akron Univ., Ohio. Dept. of Mechanical Engineering.
STATIC FIELDS OF CURVED GENERALLY LAMINATED ANISOTROPIC PLATE STRIPS
Joseph Padovan and Bernard Gosset 24 Sep. 1973 43 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Jun. 1974
Avail: NTIS HC $4.25 CSCL 20K

Through the use of Donnell type Kirchhoff shell theory, the combined effects of curvature, laminate configuration and material anisotropy on the static mechanical fields of curved generally laminated macroscopically anisotropic plate strips are studied. Due to the generality of the solution procedure used, special emphasis is given to revealing the significant effects of material orientation, curvature and possible fiber misalignments. Author

N74-16594*# Materials Sciences Corp., Blue Bell, Pa.
ANALYTICAL STUDY OF RIGIDIZED FIBROUS MATERIALS
B. Walter Rosen, Debal Bagchi, and John J. Kibler Washington NASA Feb. 1974 80 p refs
(Contract NAS1-11819)
(NASA-CR-2371; TFR/7304) Avail: NTIS HC $3.75 CSCL 20K

Insulation systems composed of micrometer-sized fibers bonded together with small amounts of binder have been developed for aerospace applications. The materials have a very high volid content and low density and can be characterized as a rigidized network of fibers randomly oriented in three-dimensional space. Analytical models suitable for the evaluation of the mechanical behavior of rigidized fibrous materials have been developed. The models treat the material as a space frame structure and includes the effects of joint fixity and fiber curvature. The geometrical and material property variabilities are represented by a number of trusses oriented in five planes. Each truss may have different material and geometric properties. Techniques have been developed to describe the continuous material property and geometry functions as a series of descrete quantities that can be used to describe each of the trusses in the model. Parametric studies were performed to show the influence of material variables on the mechanical behavior of the material. Results of calculations show good agreement with measured properties. Author

N74-16595# Laboratoire de Physique Theorique et Particules Elementaires, Orsay (France).
PERTURBATION THEORY FOR SOLIDS
Jean-Jacques Weis Nov. 1973 20 p refs
(LPTHE-73/31) Avail: NTIS HC $3.00

The perturbation theory developed by Weeks, Chandler, and Andersen is applied to the solid phase of a rare gas near its melting line. The potential is separated into two parts: (1) a reference part containing all the repulsive forces and (2) a perturbation part containing all the attractions. The expansion of the free energy in the perturbation potential is, as in the liquid phase, rapidly convergent for a temperature of the order of the triple point temperature. On the contrary the representation of the reference system by hard spheres with an appropriate diameter is less accurate than in the liquid phase. This representation requires the knowledge of the radial distribution functions of the hard sphere solid for which we give a tabulation as well as an analytical representation. The perturbation theory is applied to the determination of the fluid-solid transition. Author

N74-16596# Brown Univ., Providence, R.I. Dept. of Engineering.
NONLINEAR DYNAMICS BY MODE SUPERPOSITION
Robert E. Nickell Aug. 1973 59 p refs
(Contract N00014-67-A-0191-0025)
(AD-769243; TR-1) Avail: NTIS CSCL 20/11

A mode superposition technique for approximately solving nonlinear initial-boundary-value problems of structural dynamics is discussed and results, for examples involving large deformation, are compared to those obtained with implicit direct integration methods, such as the Newmark generalized acceleration and Houbolt backward-difference operators. The initial natural frequencies and mode shapes are found through inverse power iteration, with the trial vectors for successively higher modes being swept by Gram-Schmidt orthonormalization at each iteration. The subsequent modal spectrum for nonlinear states is based upon the tangent stiffness of the structure and is calculated by a subspace iteration procedure that involves matrix multiplication only, using the most recently computed spectrum as an initial estimate. The results indicate that a number of important advantages accrue to nonlinear mode superposition. (Modified author abstract) GRA

N74-16597# Vereinigte Flugtechnische Werke-Fokker G.m.b.H., Bremen (West Germany). Space Div.
FATIGUE OF SPACECRAFT STRUCTURES Final Report
Oct. 1973 172 p refs Prepared jointly with Natl. Aerospace Lab.
(Contract ESTEC-1846/72-AA)
(ESRO-CR(P)-322) Avail: NTIS HC $10.75

Structure type and loads to which spacecraft is subjected are described. Similarities between spacecraft fatigue and aircraft fatigue are elaborated. Recommendations to improve testing procedures, involving reductions of test loads and a more realistic simulation of service loads, are given. A manual of design practices against fatigue is proposed. ESRO

N74-16598# Oxford Univ. (England). Dept. of Engineering Science.
VOLUME OPTIMIZATION OF PIN-JOINTED FRAMEWORKS WITH VARIABLE NODAL POSITIONS
R. E. McConnel 12 Oct. 1973 36 p refs
(OUEL-1072/73) Avail: NTIS HC $4.00

The minimum weight design of pin jointed frameworks with fixed topology but variable node position was considered. Expressions were obtained for a weight function in terms of the structural variables, and restrictions on the types of structures for which these expressions are valid are discussed. A routine to calculate the weight of such frameworks was developed in terms of the free node positions, and a computer program to minimize this weight function is presented. Possible extensions of the method beyond the restricted class of structures defined are discussed, and example calculations are given. The equilibrium equations used by the computer program are listed. The specification of this program is given. Author (ESRO)

N74-16599# New York Univ., N.Y. Dept. of Aeronautics and Astronautics.
VARIATIONAL METHODS FOR ANALYSIS OF STRUCTURES Final Report
A. D. Kerr 31 Aug. 1973 10 p refs
(Grant AF-AFOSR-1990-71; AF Proj. 9782)
(AD-768609; AFOSR-73-1915TR) Avail: NTIS CSCL 20/11

The report contains a summary of research conducted in the application of variational methods in elastic stability. Particular attention is given to the nonexistence of adjacent equilibrium positions at bifurcation points. Resolution of this concept was achieved and appropriately reported in the technical literature. In addition, a plate theory considering variable Young's modulus and Poisson's ratio through the thickness was presented by the author. Author (GRA)

N74-16600# Army Missile Command, Redstone Arsenal, Ala. Ground Equipment and Materials Directorate.
ANALYSIS AND DESIGN OF THERMALLY AND MECHANICALLY PRESTRESSED FLAT PLATES SUBJECTED TO TRANSVERSE BLAST LOADS
T. L. Cost, J. R. Griffin, and R. H. Pettey May 1973 76 p refs
(DA Proj. 1M2-62303-A-214)
(AD-768770; RL-TR-72-18) Avail: NTIS CSCL 16/4

The computer code described in this report has proven to be accurate, fast, and easy to use in the analysis and design of prestressed flat plates subjected to air-blast loads, such as those caused by nuclear explosions. Studies of parameter influences can be easily carried out. The influence of loading parameters can also be evaluated. The computer code does have the limitation of linear elastic material behavior. This limitation should be overcome by extension of the method to include elastic-plastic and viscoelastic material behavior. Results of the parameter study indicate that mechanical and thermal prestresses can significantly influence the dynamic response of structures. GRA

N74-16601# Goodyear Aerospace Corp., Akron, Ohio.
DESIGN AND FABRICATION OF A COMPOSITE SANDWICH SHELL FOR OPERATION AT 3000 FEET DEPTH Final Technical Report, Oct. 1972 - Aug. 1973
Ian R. Butcher and Theodore J. Boller Aug. 1973 28 p refs
(Contract F60921-73-C-0092)
(AD-769383; GER-15984) Avail: NTIS CSCL 13/10

A program was conducted in which a 20.875 inches diameter x 100 inches long Composite Sandwich Shell was designed and fabricated to demonstrate the feasibility of applying composite materials to deep submergence structures. The fabricated shell was delivered to the Naval Ordnance Laboratory for hydrotesting. During the course of the program the shell was designed with an objective of operation at 3000 feet depth. The sandwich shell was constructed in a conventional manner with fiberglass/epoxy laminate skins and an aluminum honeycomb core. Aluminum end rings were provided at each end to facilitate pressure testing. A 3.500 inches diameter was also included in the shell. No unusual problems were encountered during the fabrication of the sandwich shell leading to the conclusion that current state of the art composite processing methods can be successfully employed in producing high performance, weight critical hydrospace composite structures. Author (GRA)

N74-16602# Washington Univ., Seattle. Dept. of Mechanical Engineering.
PHOTOELASTIC INVESTIGATION ON THE CRACK-ARREST CAPABILITY OF PRETENSIONED STIFFENED PANELS
B. G. Wade and A. S. Kobayashi Oct. 1973 35 p refs
Prepared in cooperation with McDermott (J. Ray) Co., Inc.
(Contract N00014-67-A-0103-0018; NR Proj. 064-478)
(AD-769238; TR-17) Avail: NTIS CSCL 13/3

Dynamic photoelasticity, employing a 16-spark gap Cranz-Schardin camera system, was used for dynamic analysis of propagating cracks in stiffened panels. The method of finite elements was used for a corresponding static models included 3/8 x 10 x 10-inch Homalite-100 plates with 10- and 25-percent pin-joined and bonded stringers. Static and dynamic strain energy release rates, kinetic energy release rates and stringer load concentration factors were determined in stiffened panels that were pretensioned and then impacted by a projectile. It was found that the arrest capability of a stiffened panel could be assessed through the kinetic energy release rate concept. Also bonded stiffeners were found to be more effective in arresting a propagating crack than a corresponding pin-joined stiffened panel. Author (GRA)

N74-16603# Naval Ship Research and Development Center, Annapolis, Md.
INVESTIGATION OF THE FATIGUE BEHAVIOR OF LARGE PROPELLERS Summary Report
W. Werchniak and E. J. Czyryca Oct. 1973 40 p refs
(SF35342008; SF54541007)
(AD-769466; NSRDC-4166; NSRDC-28-662) Avail: NTIS CSCL 13/10

The report summarizes the findings of an experimental study on the fatigue behavior of a full-size aircraft-carrier propeller and a patrol craft propeller. Supplementary data on the fatigue characteristics of the manganese bronze propeller material were determined. Fatigue life predictions based on nominal stress and fracture mechanics concepts are analyzed and discussed. There is evidence that with accurate inputs as to stress levels and service loadings, the fatigue life of large propellers could be predicted from specimen data using a fracture mechanics approach. Author (GRA)

N74-16604# Cambridge Acoustical Associates, Inc., Mass.
HIGH FREQUENCY RESPONSE OF POINT-EXCITED SUBMERGED THIN SHELLS AND PLATES
David A. Sachs Jul. 1973 55 p refs
(Contract N00014-69-C-0096; NR Proj. 185-301)
(AD-768900; CAA-U-415-210) Avail: NTIS CSCL 20/11

The asymptotic high frequency response of a point-excited, submerged thin cylindrical shell is evolved. The results are compared with the corresponding asymptotic responses of thin plates and spherical shells. A ray theory for the structural responses of both submerged and in-vacuo thin structures subject to point-force excitation is proposed and is shown to agree with available known solutions. Author (GRA)

N74-16605# Weidlinger Associates, New York.
DYNAMIC RESPONSE OF CYLINDRICAL SHELLS IN BILINEAR MEDIA: AXISYMMETRIC CASE Final Report, Apr. 1972 - Feb. 1973
A. T. Matthews and H. H. Bleich 1 Mar. 1973 69 p refs
(Contract DASA01-71-C-0098)
(AD-769075; DNA-3143F) Avail: NTIS CSCL 13/13

An infinitely long cylindrical shell of nominal radius R0 (the target) is surrounded by a cylinder of a bilinear material of radius RL much greater than R0. The material behaves bilinearly in bulk but linearly in shear. The shell is treated as a linear oscillator of mass m per unit area and frequency omega. At a time t = 0, the outer surface of the material at RL is suddenly loaded by an axisymmetric pressure which decreases with time. The shock is followed to the target and the reflected shock is followed back to the outer surface RL. Interest is centered on the response of the target, so that the computation is stopped at the time that the reflected wave reaches RL. A pseudo - characteristic method is used for the computation. The results presented permit

the independent checking of results from finite difference or finite element codes for the case of axisymmetric wave propagation.
Author (GRA)

N74-16606# Naval Ship Research and Development Center, Bethesda, Md.
INCREMENTAL ANALYSIS OF NONLINEAR STRUCTURAL MECHANICS PROBLEMS WITH APPLICATIONS TO GENERAL SHELL STRUCTURES Final Report
Rembert F. Jones, Jr. Sep. 1973 107 p refs
(AD-769465; NSRDC-4142) Avail: NTIS CSCL 20/11

The primary theme is the nonlinear behavior of shell structures. A general formulation that can be applied to all structures is derived and then specialized for application to shells through the development of a quadrilateral shell finite element. The formulation is in incremental form and is derived in terms of the material coordinate system. The quadrilateral shell element which is introduced uses the exact geometry of the shell surface in the computation of stiffness matrices and loads. A consistent method is used for transforming the element and its properties; this improves element effectiveness for application to branched and reinforced shells. The shell surface geometry is used in the enforcement of the continuity of displacements for satisfying the convergence requirements. The ability of the element to undergo rigid body motion without causing strains is examined by studying the eigenvalues of the stiffness matrix of an element. (Modified author abstract) GRA

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N74-16607 Minnesota Univ., Minneapolis.
A STUDY OF THE POST-FLAME GASES OF HYDROCARBON-AIR FLAMES Ph.D. Thesis
Michael Harvey Barnes 1973 229 p
Avail: Univ. Microfilms Order No. 73-25579

The post-flame gases of pre-mixed flames of air and methane, ethane, propene, and binary mixtures of these fuels were studied experimentally. The flames were observed on a porous disc burner, which yields relatively low temperature flames. In addition, heat loss from the flame and its products was increased through a screen mounted directly above the flame. The hydrocarbon products measured, and carbon monoxide, were in most cases present in concentrations greater than equilibrium for the observed temperatures. A model to describe the behavior of these flame products was constructed. The presence of hydrocarbons in flame products allows measurement of global competitive rate constraints for the binary fuels. Values were measured over a range of conditions. The possible effect of thermal diffusion on flame reaction zone stoichiometry was considered and it was found that this effect may be important in multi-component fuel flame systems. Dissert. Abstr.

N74-16608 Ohio State Univ., Columbus.
TURBULENCE IN FREE DIFFUSION FLAMES OF HYDROGEN-NITROGEN MIXTURES BURNING IN STILL AIR Ph.D. Thesis
Roger Ronald Craig 1973 159 p
Avail: Univ. Microfilms Order No. 73-26792

The measurement of time averaged flow variables and turbulence intensities in turbulent diffusion flames was studied. The difficulties encountered in separating the effect temperature, velocity and species concentration on a hot-film anemometer signal required the use of special techniques for measuring the turbulence in the diffusion flames. Radial turbulence intensity can simply be deduced from static pressure defect measurements in the flame. However, measurement of axial turbulence intensity required the development of a probe for measuring the fluctuating pitot pressure. Results obtained in an axisymmetric air jet by both methods are compared with data obtained from a crossed hot-film anemometer. Equations are derived for computing the axial turbulence from the fluctuating pitot pressure in non-reacting flows as well as in flows with density fluctuations.
Dissert. Abstr.

N74-16609 Cincinnati Univ., Ohio.
HEAT TRANSFER BETWEEN A ROW OF AIR JETS AND A HEATED PLATE Ph.D. Thesis
Rao S. Ravuri 1973 136 p
Avail: Univ. Microfilms Order No. 73-26126

Experimental determinations are presented of the average heat transfer coefficients of a row of axisymmetric air jets impinging on the inside surface of a heated semi-cylindrical plate. The effects due to jet to jet spacing, the jet height, the positioning of the jets and the diameter of the semi-cylinder are studied. A general trend of the average Nusselt Number variation with the Reynolds Number is established. A simplified model is used as the theoretical model. The cooling phenomenon is approximated by each axisymmetric jet cooling a fraction of the plate. Curvature effects, compressibility effects and those due to turbulence are neglected. A numerical solution is obtained by solving for vorticity and stream functions by iterative finite-difference techniques. The computed heat transfer rates are found to be lower than the experimentally determined values. The discrepancy is attributed to the assumptions made and, in particular, to the non-turbulent flow. Dissert. Abstr.

N74-16610 Illinois Univ., Chicago.
ASYMPTOTIC AND NUMERICAL METHODS FOR THE THEORY OF HETEROGENEOUS IGNITION Ph.D. Thesis
Shu-Chien Yung 1973 195 p
Avail: Univ. Microfilms Order No. 73-26653

The following three systems were successively employed to study the heterogeneous behavior of solid fuels: (1) the quiescent unsteady system, which consists of a semi-infinite slab of fuel reacting at the surface in the presence of an oxidizing atmosphere; (2) the forced convective system, where a stream of reactants flows past a flat fuel surface; an exothermic reaction occurs on the surface where the active constituents of the fluid react with the solid wall; and (3) the natural convective system, where a vertical fuel surface is embedded in a fluid which consists of chemically reactive components; the fluid motion considered here is solely generated by a buoyant force which is a result of the surface chemical reaction. Mathematical solutions are presented for surface temperature history for the quiescent unsteady system, along with the surface temperature profile in terms of the distance along the flow direction for the forced convective and the natural convective systems. Dissert. Abstr.

N74-16611 California Univ., Davis.
A DESCRIPTION OF BUOYANT PLUMES IN A STILL ATMOSPHERE Ph.D. Thesis
Ronald Ward Keil 1972 106 p
Avail: Univ. Microfilms Order No. 73-19086

A method of describing the rise and subsequent dispersal of buoyant plumes in a calm atmosphere is presented. The method is based on consideration of continuity, momentum and the first law of thermodynamics, and consists of a system of differential equations which are integrated simultaneously from a set of inititial conditions. Variations of temperature and humidity of the atmosphere are included, and the calculation takes into account both condensation and re-evaporation of water in the rising air. Excellent agreement on the order of 1% is reached between observed plume heights and the heights predicted by this method under the same conditions. Agreement is also good between the predicted altitude and the height predicted by a standard, semiempirical formula, although both the observed plume and the present prediction exceeded the standard prediction by about 15%. Dissert. Abstr.

N74-16612 California Univ., San Diego.
LOW TEMPERATURE THERMAL CONTACT TO LIQUID He3 Ph.D. Thesis
James Henry Bishop 1973 227 p
Avail: Univ Microfilms Order No. 73-24501

An experimental study of the thermal energy exchange between liquid He3 and the paramagnetic salts CMN and CDP, and between liquid He3 and several Pt samples has been made

at millikelvin temperatures in applied magnetic fields of magnitude from zero to about 40 G. An apparatus which is precooled by a dilution refrigerator and which employs a SQUID as part of an ac mutual inductance bridge was used in the measurements and is described in some detail. In a preliminary experiment, the time constants for thermal equilibrium between a mixture of powdered CMN and liquid He3 were found to be increased substantially when enough He4 impurity were present in the liquid He3 to produce a coverage of a few monolayers of He4 on the CMN surface. From measurements on a single crystal sample and a powdered sample of CMN one may distinguish three contributions to the thermal resistance between the CMN spins and the liquid He3. Dissert. Abstr.

N74-16613*# Boeing Aerospace Co., Kent, Wash.
FUNDAMENTAL STUDY OF TRANSPIRATION COOLING Final Report
J. C. Y. Koh, J. L. Dutton, and B. A. Benson Aug. 1973 176 p refs
(Contract NAS3-12012)
(NASA-CR-134523) Avail: NTIS HC $11.00 CSCL 20M

Isothermal and non-isothermal pressure drop data and heat transfer data generated on porous 304L stainless steel wire forms, sintered spherical stainless steel powder, and sintered spherical OFHC copper powder are reported and correlated. Pressure drop data was collected over a temperature range from 500 R to 2000 R and heat transfer data collected over a heat flux range from 5 to 15 BTU/in2/sec. It was found that flow data could be correlated independently of transpirant temperature and type (i.e., H2, N2). It was also found that no simple relation between heat transfer coefficient and specimen porosity was obtainable. Author

N74-16614*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
OUTER SKIN PROTECTION OF COLUMBIUM THERMAL PROTECTION SYSTEM (TPS) PANELS Final Technical Report
John D. Culp Sep. 1973 129 p refs
(Contract NAS3-15546)
(NASA-CR-134535; MDC-E0913) Avail: NTIS HC $8.50 CSCL 20M

A coated columbium alloy material system 0.04 centimeter thick was developed which provides for increased reliability to the load bearing character of the system in the event of physical damage to and loss of the exterior protective coating. The increased reliability to the load bearing columbium alloy (FS-85) was achieved by interposing an oxidation resistant columbium alloy (B-1) between the FS-85 alloy and a fused slurry silicide coating. The B-1 alloy was applied as a cladding to the FS-85 and the composite was fused slurry silicide coated. Results of material evaluation testing included cyclic oxidation testing of specimens with intentional coating defects, tensile testing of several material combinations exposed to reentry profile conditions, and emittance testing after cycling of up to 100 simulated reentries. The clad material, which was shown to provide greater reliability than unclad materials, holds significant promise for use in the thermal protection system of hypersonic reentry vehicles. Author

N74-16615*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
DIFFUSIVE IGNITION AND COMBUSTION IN A WALL JET
A. P. Kurkov and R. E. Gaugler 1974 28 p refs Proposed for presentation at Symp. on the Fluid Mech. of Combust., Montreal, 13-16 May 1974; sponsored by ASME
(NASA-TM-X-71496; E-7810) Avail: NTIS HC $3.50 CSCL 21B

Hydrogen is injected from a downstream facing step in a wall into a high-temperature stream. Temperature and hydroxyl radical concentration are measured downstream of the injection plane by means of ultraviolet absorption spectroscopy. The experimental results are compared with theory which is based on a finite-difference solution of boundary-layer equations. Finite-rate kinetics equations are included in the analysis. The analytic predictions are also compared with previously obtained experimental results which are based on probe measurements. Comparison is made between calculated and observed ignition distances. Author

N74-16616# Swiss Inst. of Meteorology, Zurich.
USE OF CLIMATOLOGICAL DATA IN BUILDING DESIGN WITH RESPECT TO ECONOMY
Peter Valko Dec. 1972 21 p refs Presented at CIB/WMO Colloq. on Building Climatology "Teaching the Teachers", Stockholm, Sep. 1972
(Rept-34) Avail: NTIS HC $3.25

The building with its various planning and operational processes is considered a weather sensitive economic system. The impact of weather and climate affects the economic output of building enterprises. By using suitable design weather information in decision making, economic gain may be expected. Published benefit figures are of the order of 0.5 per cent of the total production of the construction industry, while for heating and air-conditioning several times higher relative benefits may be expected. Author

N74-16617# Swiss Inst. of Meteorology, Zurich.
THE EFFECT OF SHAPE AND ORIENTATION ON THE RADIATION IMPACT ON BUILDINGS
Peter Valko Dec. 1972 14 p refs Presented at CIB/WMO Colloq. on Building Climatology "Teaching the Teachers", Stockholm, Sep. 1972
(Rept-33) Avail: NTIS HC $3.00

Building planning needs suitable information on radiation conditions, especially with respect to air-conditioning and daylight design. A survey on the origin and preparation of the data used is presented, and the significance of the diffuse component of the total radiation impact is emphasized. The adaptation of the irradiation functions is demonstrated for summer and winter conditions at 0 m altitude for the geographic latitude of 47 deg N. Numerical examples in cases of rectangular and cylindrical buildings illustrate daily and hourly radiation load changes against variation of building shape and facade orientation. Author

N74-16618*# Pennsylvania State Univ., University Park. Dept. of Mechanical Engineering.
HIGH PRESSURE COMBUSTION OF LIQUID FUELS
G. S. Canada Jan. 1974 147 p refs
(Grant NGR-39-009-077)
(NASA-CR-134540) Avail: NTIS HC $9.50 CSCL 21B

Measurements were made of the burning rates and liquid surface temperatures for a number of alcohol and n-paraffin fuels under natural and forced convection conditions. Porous spheres ranging in size from 0.64-1.9 cm O.D. were emloyed to simulate the fuel droplets. The natural convection cold gas tests considered the combustion in air of methanol, ethanol, propanol-1, n-pentane, n-heptane, and n-decane droplets at pressures up to 78 atmospheres. The pressure levels of the natural convection tests were high enough so that near critical combustion was observed for methanol and ethanol vaporization rates and liquid surface temperature measurements were made of droplets burning in a simulated combustion chamber environment. Ambient oxygen molar concentrations included 13%, 9.5% and pure evaporation. Fuels used in the forced convection atmospheric tests included those listed above for the natural convection tests. The ambient gas temperature ranged from 600 to 1500 K and the Reynolds number varied from 30 to 300. The high pressure forced convection tests employed ethanol and n-heptane as fuels over a pressure range of one to 40 atmospheres. The ambient gas temperature was 1145 K for the two combustion cases and 1255 K for the evaporation case. Author

N74-16619*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FORCED-CONVECTION PEAK HEAT FLUX ON CYLINDRICAL HEATERS IN WATER AND REFRIGERANT 113
Thomas H. Cochran and Charles R. Andracchio Washington Feb. 1974 22 p refs
(NASA-TN-D-7553; E-7659) Avail: NTIS HC $2.75 CSCL 20M

An investigation was conducted of the peak heat flux on cylindrical heaters in a fluid flowing perpendicular to the major axis of the heater. The test fluids were water and Refrigerant 113. Heaters of 0.049 to 0.181 cm diameter were tested over

a fluid velocity range of 10.1 to 81.1 cm/sec. The experimental results were observed to fall within two regions based on the vapor removal geometry: jets or sheets. Mathematical models for each region successfully correlated the data for both fluids.
Author

N74-16620# Bureau of Mines, Pittsburgh, Pa. Energy Research Center.
AN ECONOMIC EVALUATION OF MHD-STEAM POWER-PLANTS EMPLOYING COAL GASIFICATION
P. D. Bergman, K. D. Plants, J. J. Demeter, and D. Bienstock 1973 37 p refs
(BM-RI-7796) Avail: NTIS HC $4.00

To assess the efficacy and economics of producing power from coal, four open-cycle magnetohydrodynamic (MHD) processing schemes were selected for study. Each involved a different mode of coal combustion and level of gas cleanliness. The options considered were: (1) coal burned in a slagging combustor; (2) suspension gasification with slag removal prior to combustion; (3) parallel cyclone combustors, one operating fuel rich and the other operating with excess air; and (4) suspension gasification by the hot exhaust gases from the MHD duct with ash removed prior to combustion. Option 1 has the highest ash content in the combustion plasma and as a result would have the greatest operational difficulties associated with it. Options 2 and 4 have the cleanest MHD combustion plasma. For coal priced at $4/ton, the power generating cost of Option 4, 11.78 mills/kW-hr, is the highest, with Option 1, at 9.04 mills/kW-hr the lowest. These costs may be compared with a conventional power cost of 9.92 mills/kW-hr for the late seventies. Capital costs of three of the four options were competitive with those of conventional thermal power plants employing stack gas SO2 cleanup systems. Option 2 has the most favorable combination of operating characteristics and power cost. It was concluded that a clean, high-temperature working fluid can probably be produced from coal without leading to depressed system efficiencies and exorbitant capital cost.
Author

N74-16621*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF PRESSURE, OXYGEN CONCENTRATION, AND FORCED CONVECTION ON FLAME SPREAD RATE OF PLEXIGLAS, NYLON AND TEFLON
Julius J. Notardonato, Leo A. Burkhardt, and Thomas H. Cochran Washington Feb. 1974 28 p refs
(NASA-TN-D-7555; E-7611) Avail: NTIS HC $3.00 CSCL 21B

Experiments were conducted in which the burning of cylindrical materials in a flowing oxidant stream was studied. Plexiglas, Nylon, and Teflon fuel specimens were oriented such that the flames spread along the surface in a direction opposed to flowing gas. Correlations of flame spread rate were obtained that were power law relations in terms of pressure, oxygen concentration, and gas velocity.
Author

N74-16622*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
HEAT TRANSFER CHARACTERISTICS OF AN EMERGENT STRAND
William Emile Simon, Larry Claude Witte (Houston Univ.), and Pat Garner Hedgcoxe (Houston Univ.) Washington Feb. 1974 39 p refs
(NASA-TN-D-7584; JSC-S-362) Avail: NTIS HC $3.00 CSCL 20M

A mathematical model was developed to describe the heat transfer characteristics of a hot strand emerging into a surrounding coolant. A stable strand of constant efflux velocity is analyzed, with a constant (average) heat transfer coefficient on the sides and leading surface of the strand. After developing a suitable governing equation to provide an adequate description of the physical system, the dimensionless governing equation is solved with Laplace transform methods. The solution yields the temperature within the strand as a function of axial distance and time. Generalized results for a wide range of parameters are presented, and the relationship of the results and experimental observations is discussed.
Author

N74-16623*# Pennsylvania State Univ., University Park. Dept. of Engineering Mechanics.
MEASUREMENT AND ANALYSIS OF FORCE-TIME OUTPUTS OF PYROTECHNIC NUTS
Vernon H. Neubert [1973] 62 p refs
(Contract NAS1-12045)
(NASA-CR-132370) Avail: NTIS HC $5.25 CSCL 19A

The dynamic loadings produced by two standard pyrotechnic nuts were compared with loadings produced by four recently developed low-shock nuts. The nuts were manufactured by separate contractors. Each nut was given a number designation, the number having no special significance. The results show that the use of the Hopkinson bar to measure force-time outputs of the nuts at stud and housing sides aided greatly in understanding the events occurring in the nuts. Acceleration data appear to be dependable, for the most part, but of more limited value. The low-shock designs show considerable improvement over the standard designs above 4,000 Hz when the results are plotted in shock spectrum form. They involve some penalties with regard to weight and cost.
Author

N74-16624# Southampton Univ. (England). Dept. of Aeronautics and Astronautics.
EQUATIONS OF TURBULENT COMBUSTION. PART 1: FUNDAMENTAL EQUATIONS OF REACTING TURBULENT FLOW
K. N. C. Bray Oct. 1973 45 p refs
(Grant SRC-B/RG/3552)
(AASU-330) Avail: NTIS HC $4.25

Rigorous time-averaged balance equations were derived and cataloged for a turbulent flow consisting of a reacting mixture of ideal gases, each with a constant heat of formation and constant specific heats. The balance equations considered include those for the mass, momentum, and energy of the mixture, and also for turbulence kinetic energy and fluctuations in vorticity and thermodynamic state variables. Reaction-rate dependent terms were identified which were not considered in turbulent combustion modeling studies.
Author (ESRO)

N74-16625# Ocean and Atmospheric Science, Inc., Dobbs Ferry, N.Y.
WAKE CHARACTERISTICS STUDIES Final Report
C. D. Grosch, Bernard Harris, E. Y. T. Kuo, M. Bernstein, and R. Gershman 15 Apr. 1973 10 p refs
(Contract N00014-72-C-0127; ARPA Order 1910)
(AD-768038; OAS-TR-73-173) Avail: NTIS CSCL 19/1

The technical details of this contract and its extension are briefly summarized. Specific signal areas of investigation are: diffusion in the wake, signal processing of ocean surface waves, and analyses of oceanographic experiments.
Author (GRA)

N74-16626# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE THEORY OF COMBUSTION AND DETONATION
K. I. Shchelkin 12 Sep. 1973 152 p Transl. into ENGLISH from the mono. "Mekhanika v SSR za 50 Let, v. 2" 1970 p 344-422
(AD-767985; FTD-MT-24-324-73) Avail: NTIS CSCL 19/4

The translation reviews and discusses theories of combustion, flame propagation and instability in explosions, detonations, and normal burning.
GRA

N74-16627# National Environmental Research Center, Research Triangle Park, N.C. Control Systems Lab.
PROCEEDINGS, COAL COMBUSTION SEMINAR
Robert E. Hall and David W. Pershing Sep. 1973 305 p refs Seminar held at Res. Triangle Park, N. C., 19-20 Jun. 1973
(PB-224210/5GA; EPA-650/2-73-021) Avail: NTIS HC $7.00 CSCL 21B

The proceedings document the 10 presentations made during the Seminar, which dealt with subjects related to EPA's research and development activities for control of air pollutant emissions from the combustion of pulverized coal. The Seminar was divided in two parts: participating in the portion on fundamental research were Rockwell International's Rocketdyne Division, KVB Engineering, Inc. and Southern California Edison Co., EPA Holland's International Flame Research Foundation, and Jet Propulsion Laboratory; and taking part in the portion on pilot- and full-scale

tests were Babcock and Wilcox (Alliance Research Center), U.S. Bureau of Mines, Esso Research and Engineering Co., Combustion Engineering, Inc., and Tennessee Valley Authority. Purpose of the Seminar was to provide contractors and industrial representatives with the latest information on coal combustion research. GRA

N74-16628# TRW Systems Group, Redondo Beach, Calif. Space Vehicles Div.
EXPERIMENTAL STUDY OF CAVITY DYNAMICS AND WAVE PROPAGATION Final Report, 15 Mar. 1972 - 30 Jun. 1973
D. R. Tomren and J. D. OKeefe 23 Oct. 1973 79 p refs
(Contract N00014-72-C-0224; NR Proj. 089-081)
(AD-769350; TRW-AT-SVD-TR-73-11) Avail: NTIS CSCL 19/4

Pulsed laser transmission holography (single exposure, double exposure and differential exposure) has successfully recorded small scale underwater detonations. Moire techniques with grids were used to supplement the holographic techniques. Holographic data were used to yield pressure distribution behind shock fronts. In addition, a limited number of experiments were also performed to study the interaction of shocks with free surface and bottom boundaries. Holographic techniques provide a clear visualization in three dimensions of the nature of the interactions of the shock wave with varying bottom conditions and can be used to obtain quantitative data pertaining to shock and acoustic waves from interactions with boundaries. Author (GRA)

N74-16629# Rocket Propulsion Establishment, Westcott (England).
TABLES FOR THE ISENTROPIC EXPANSION OF IDEAL GASES WITH CONSTANT RATIO OF SPECIFIC HEATS IN THE SUBSONIC REGION
A. T. Jeffs and M. E. Penny Jan. 1972 49 p
(AD-769123; RPE-TM-587; BR31082) Avail: NTIS CSCL 07/4

Tables of values relating to the isentropic expansion of an ideal gas with constant ratios of specific heats have been prepared to cover the subsonic flow region. They are intended to complement the tables of values given in Tech. Memos Nos 283-288, 301-306 and 339 which cover the supersonic flow region. GRA

N74-16630# Midwest Research Inst., Kansas City, Mo.
THE MEASUREMENT OF ENTHALPIES OF GASEOUS MIXTURES BY FLOW MIXTURES BY FLOW CALORIMETRY Final Report, 15 Mar. 1968 - 14 Mar. 1973
Jerome Brewer 1973 34 p refs
(Contract F44620-68-C-0064; AF Proj. 9750; MRI Proj. 3168-C)
(AD-769452; AFOSR-73-1688TR) Avail: NTIS CSCL 07/4

An attempt to develop calorimetric data to supplement low pressure PVT data on the enthalpies of pure and mixed gases is described. Bases for selection of a boiling type calorimeter are discussed and the design and operation of such a unit are described. Data analysis techniques are presented along with details of methods for compensation of heat leaks and other errors inherent in calorimetry. While the experiment was unsuccessful, it does reveal precautions needed in large scale, wide pressure range calorimetry and it does suggest that the method can be successful with application of the techniques learned. Author (GRA)

N74-16631# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PROPAGATION OF SMALL-AMPLITUDE WAVE OVER THE SURFACE OF POWDER BURNING IN A GAS FLOW
V. B. Librovich and G. M. Makhviladze 30 Oct. 1973 14 p refs Transl. into ENGLISH from the monograph "Gorenie i Vzryv" USSR, 1972 p 110-114
(AD-769575; FTD-HT-23-637-74) Avail: NTIS CSCL 21/2

A study was made of the effects of gases, flowing at a certain threshold velocity value along a burning powder surface, on combustion rates. Specifically, powder combustion in a gas flow in which a periodic small amplitude wave is propagated across the surface of the powder is examined. GRA

N74-16632# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE INFLUENCE OF HEAT LOSSES ON THE PROPAGATION OF AN EXOTHERMAL REACTION FRONT IN THE CONDENSED PHASE
K. G. Shkadinskii and B. I. Khaikin 23 Oct. 1973 10 p refs Transl. into ENGLISH from the monograph "Gorenie i Vzryv" 1972 p 104-109
(AD-769330; FTD-HT-23-636-74) Avail: NTIS CSCL 21/2

The stationary propagation of an exothermal reaction front in gas-free condensed systems has been studied previously in a number of works. In one it was shown that under specific conditions, stationary burning is unstable and the reaction front propagates in the pulsed mode; the boundary separating both modes (stationary and pulsating) was determined, and the structure and dynamics of oscillations in the pulsation mode was studied. However, the real burning of gas-free condensed systems is always accompanied by heat losses, and therefore it is interesting to study the influence of these losses on various burning regimes. GRA

N74-16633# University of Southern Calif., Los Angeles. Dept. of Mechanical Engineering.
THE 9TH AFOSR COMBINED CONTRACTORS' MEETING ON COMBUSTION DYNAMICS RESEARCH: ABSTRACTS
M. Gerstein Aug. 1973 82 p Conf. held at Los Angeles, 20-24 Aug. 1973
(Grant AF-AFOSR-1918-70; AF Proj. 9711)
(AD-769453; AFOSR-73-1919TR) Avail: NTIS , CSCL 21/2

The report consists of a collection of abstracts of the numerous research progress reports given by AFOSR contractors. These papers presented over a five-day period composed the Ninth Annual Meeting of Combustion Dynamics Research. Each paper was grouped under one of the three major subject headings: Advanced Air Breathing Combustion, Liquid Propellant Rocket Combustion, or Solid Propellant Rocket Combustion. Author (GRA)

N74-16634# Naval Postgraduate School, Monterey, Calif.
BASE DRAG REDUCTION BY EXTERNAL BURNING M.S. Thesis
Gary Joe Caswell Sep. 1973 76 p refs
(AD-769803) Avail: NTIS CSCL 19/1

Supersonic combustion in the inviscid stream has been shown to reduce the base drag on a projectile. Fast reacting fuel burned externally in the inviscid, supersonic flow generates compression waves, which, when properly originated, impinge on the recirculation bubble aft of the projectile base and increase the base pressure. A free-jet wind tunnel was constructed to study external burning where heat addition was simulated by nozzle contour. Sufficient increase in base pressure was attained to not only reduce base drag but also provide thrust. Thus, external burning provides a method for increasing the performance of projectiles. Author (GRA)

N74-16635# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PRODUCT DISTRIBUTION AND INDUCTION TIMES IN THE SHOCK-INITIATED IGNITION OF CYANOGEN-OXYGEN-ARGON MIXTURES M.S. Thesis
Davy M. Bass Mar. 1973 80 p refs
(AD-769502; GAW/ME/73-1) Avail: NTIS CSCL 07/4

Mixtures of cyanogen and oxygen diluted in argon were ignited behind reflected shocks in a single-pulse shock tube. The ignition delay times were determined from pressure observations. The experiments covered the temperature range 1400 K to 2000 K. This range permitted ignition delay times from 15 to 430 microseconds. Eight mixture groups and their initial conditions were chosen in such a manner that the influence of each particular parameter on the induction period would be unequivocally evaluated. The resulting equation for induction time was determined. Product distribution before and after ignition was determined by mass spectroscopy. Results indicated that the combustion of cyanogen is thermodynamically controlled. Hydrogen lowers activation energy and shortens induction time. This indicates that with the addition of H2 a chain branching mechanism becomes rate controlling (Modified author abstract) GRA

N74-16636# Ballistic Research Labs., Aberdeen Proving Ground, Md.
HOT PLATE FLAMMABILITY TESTS
Richard C. Strittmater and Hughes E. Holmes May 1973 18 p ref
(DA Proj. 1J5-62604-A-010)
(AD-762149; BRL-MR-2292) Avail: NTIS CSCL 19/1

A flammability test apparatus has been constructed which applies a propellant test specimen to a heated copper block for precisely controlled intervals of time. In this way the ignition time can be determined as a function of the copper block temperature. Ignition time is defined as the shortest time interval over which the propellant sample must be applied to the copper block so that sustained burning occurs. Data has been obtained for a double base propellant, X-14, some experimental propellants formulated at Princeton University and two Thiokol/Wasatch propellants. Author (GRA)

N74-16637# Arizona Univ., Tucson. Dept. of Chemistry.
IMPROVEMENTS IN FLAME EMISSION SPECTROMETRY THROUGH THE USE OF ULTRASONIC NEBULIZATION INTO A PREMIXED OXYGEN-HYDROGEN FLAME
D. E. Gutzler and M. B. Denton Oct. 1973 26 p refs
(Contract N00014-67-A-0209-0019; NR Proj. 051-549)
(AD-768374; TR-4) Avail: NTIS CSCL 07/4

A laminar flow premixed oxygen-hydrogen flame when combined with ultrasonic nebulization has improved detection limits approaching three orders of magnitude when compared to a conventional turbulent oxygen-hydrogen flame used in flame emission spectrometry. In a comparison with two other premixed flames, the premixed oxygen-hydrogen flame gave the lowest detection limits for elements with wavelengths longer than 4000 A. The increased sensitivity is attributed to the low flame background emission and reduced flame flicker. (Modified author abstract) GRA

N74-16638# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Trauen (West Germany).
COMBUSTION MECHANISM OF COMPOSITE PROPELLANT DURING DEPRESSURIZATION Final Report, 1 Jan. 1971 - 31 Dec. 1972
Horst Selzer Jul. 1973 9 p refs
(Contract F44620-71-C-0118; AF Proj. 9711)
(AD-769445; AFOSR-73-1947TR) Avail: NTIS CSCL 21/2

The investigations of the extinguishing by depressurization resulted in a period of low gas temperature after the stop of the steady state flame and before the redevelopment of a second flame. By comparison of the depressurization rate and the time intervals for a 50% pressure decay, the continued gasification of the propellant could be measured. Surface structure analysis by Scanning Electron Microscope enabled the determination of the oxidizer/binder area ration on the extinguished surface, furthermore the burning of local spots to about 0.1 mm propellant thickness during the phase of extinguishing. The measurements included 16 different propellant mixtures at pressure levels of 25 bar, 45 bar, and 95 bar. GRA

N74-16639# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE INFLUENCE OF NATURAL CONVECTION ON THE IGNITION OF LIQUID SYSTEMS
E. A. Shtessel, A. E. Averson, and K. V. Pribytkova 6 Nov. 1973 10 p refs Transl. into ENGLISH from the book "Gorenie i Vzryv" USSR, 1972 p 24-29
(AD-769571; FTD-HT-23-617-74) Avail: NTIS CSCL 20/13

The results of the current thermal theory of ignition can be successfully applied only for gases at rather low pressures and for solid condensed systems, where there is no natural convection. A description of the process of ignition of liquid systems requires consideration of the motion of the liquid, occurring due to natural convection. The paper is devoted to an approximate theoretical analysis of the phenomenon of ignition with consideration of heat- and mass transfer under conditions of natural convection. GRA

N74-16640# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
COMBUSTION OF POWERED METALS IN ACTIVE MEDIA
P. F. Pokhil, A. F. Belyaev, Yu. V. Frolov, V. S. Logachev, and A. I. Korotkov 18 Oct. 1973 217 p refs Transl. into ENGLISH of the book "Goreniye Poroshkoobraznykh Metallov v Aktivaykh Sredakh" USSR, 1972 p 1-295
(AD-769576; FTD-MT-24-551-73) Avail: NTIS CSCL 21/2

This book deals with the subject of igniting and burning such metals as aluminum, beryllium, magnesium, boron, lithium and others. These mistakes are used to improve the physical and chemical characteristics of rocket propellants. Extensive experimental and theoretical material obtained by Soviet and foreign authors during the last 10-15 years is presented and generalized. Contemporary research methods and the basic rules of metal ignition and burning are discussed. The effect of metal addititives on physical and energy parameters of powders and explosives is discussed. GRA

N74-16306* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
INFLIGHT THERMODYNAMIC PROPERTIES
S. Clark Brown, Glenn E. Daniels, Dale L. Johnson, and Orvel E. Smith *In its* Terrest. Environ. (Climatic) Criteria Guidelines for Use in Aerospace Vehicle Develop., 1973 Rev. 5 Jul. 1973 34 p refs (For availability see N74-16292 07-20)
CSCL 20M

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N74-16641 Committee on Interior and Insular Affairs (U. S. Senate).
A BIBLIOGRAPHY OF NON-TECHNICAL LITERATURE ON ENERGY
Flora Dean, comp. Washington GPO 1971 104 p refs Presented to Comm. on Interior and Insular Affairs, 92d Congr., 1st Sess., 5 Nov. 1971 Prepared by Library of Congr.
Avail: Comm. on Interior and Insular Affairs

A bibliography of non-technical literature on energy sources and problems was prepared for the Committee on Interior and Insular Affairs of the United States Senate. The reports cover the period of time from 1 July 1969 to 1 July 1971. The subjects covered include the following: (1) national energy goals, (2) energy policy issues, (3) projections for future demands, (4) resource base for all energy sources, (5) management of federally owned resources, (6) production of fuels, (7) transportation of energy and fuels, (8) utilization (including conservation measures), and (9) environmental effects (relation of environmental policy to energy policy). P.N.F.

N74-16642 Committee on Interior and Insular Affairs (U. S. Senate).
A BIBLIOGRAPHY OF CONGRESSIONAL PUBLICATIONS ON ENERGY FROM THE 89TH CONGRESS TO 1 JULY 1971
Dana C. Ellingen, comp. and William E. Towsey, Jr., comp. Washington GPO 1971 63 p refs Presented to Comm. on Interior and Insular Affairs, 92d Congr., 1st Sess., 5 Nov. 1971
Avail: Comm. on Interior and Insular Affairs

A bibliography of Congressional Publications on Energy Resources and Requirements is presented. The documents cover the period of time from 1 January 1965 to 30 June, 1969. The subjects included in the bibliography are: (1) national energy goals, (2) energy policy issues, (3) projections of future demands, (4) resource base for all types of energy sources, (5) management of federally owned resources, (6) production of fuels (including storage), (7) transportation of energy and fuels, (8) utilization (including conservation measures), (9) environmental effects, (10) research and development of resources, and (11) changing and improving regulatory practices. P.N.F.

N74-16643# Joint Publications Research Service, Arlington, Va.

TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 380
18 Jan. 1974 64 p Transl. into ENGLISH from various Soviet publications
(JPRS-61017) Avail: NTIS HC $5.25

Articles, concerning the development and progress in various theoretical and applied scientific disciplines and technical fields, are presented. Data are also given on the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions. For individual titles, see N74-16644 through N74-16645.

N74-16644 Joint Publications Research Service, Arlington, Va.
FIRST HUNGARIAN CONFERENCE ON SYSTEMS THEORY REVIEWED **c10**
Istvan Kiss *In its* Transl. on Eastern Europe: Sci. Affairs, No. 380 (JPRS-61017) 18 Jan. 1974 p 28-39 Transl. into ENGLISH from Magy. Tud. (Budapest), no. 11, 1973 p 756-762 (For availability see N74-16643 07-34)

Domestic problems of systems theory, based on internationally generated information, emphasizing creative organizational systems are discussed. Data are also given on models facilitating the characterization of complexity, methodology, and interdisciplinary communications in a system. Special attention was given to: (1) problems of verbal and formal models developed for the comprehension, handling, and study of general complexity and system complexity, (2) the study of individual and collective versions of creativity, and theory of problem solving, (3) possible applications of systems theory at its present state of development, and (4) investigation of systems theoretical planning for systems of various kinds and degrees of complexity. Author

N74-16645 Joint Publications Research Service, Arlington, Va.
SEMICONDUCTOR INDUSTRY DEVELOPMENT PROGRAM OUTLINED **c26**
Stanislaw Gondek *In its* Transl. on Eastern Europe: Sci. Affairs, No. 380 (JPRS-61017) 18 Jan. 1974 p 40-46 Transl. into ENGLISH from Radioamator i Krotkofalowiec, (Poland), no. 11, Nov. 1973 p 363-365 (For availability see N74-16643 07-34)

The history of the semiconductor industry in Poland is outlined. Data are also given on modern techniques and technologies use for developing semiconductor connections. A list is presented of semiconductor devices developed over the years and of those under consideration. E.H.W.

N74-16646# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 377
9 Jan. 1974 60 p refs Transl. into ENGLISH from East European Journals
(JPRS-60949) Avail: NTIS HC $5.00

Selected articles are presented concerning the development, administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, and particularly the academies of sciences. For individual titles, see N74-16647 through N74-16650.

N74-16647 Joint Publications Research Service, Arlington, Va.
WORK OF MATHEMATICAL COMPUTER CENTER DISCUSSED **c08**
Vasil Zenjo *In its* Transl. on Eastern Europe: Sci. Affairs, no. 377 (JPRS-60949) 9 Jan. 1974 p 1-2 Transl. into ENGLISH from Zeri i Popullit (Albania), 8 Dec. 1973 p 3 (For availability see N74-16646 07-34)

The achievments and problems of a mathematical computer center in Albania are briefly reviewed for it's first two years of operation. Among the successes achieved by the center, the following are cited: (1) the framework of a new hotel in Tirana, (2) the construction of the Fierze hydroelectric power plant, (3) the national power grid, (4) agricultural problems, (5) the measurement of timber reserves, and (6) the solution of a number of problems concerning the optimal utilization of metal-cutting machinery in the country's engineering plants. One of the major problems of the center is the lack of work load. It is stated that the equipment is being used in only one shift, whereas it would be possible to use it 20 to 23 hours out of every 24. D.L.G.

N74-16648 Joint Publications Research Service, Arlington, Va.
PRACTICAL ASPECTS OF NUCLEAR SCIENCE DEFENDED **c24**
Khristo Khristov *In its* Transl. on Eastern Europe: Sci. Affairs, no. 377 (JPRS-60949) 9 Jan. 1974 p 3-5 Transl. into ENGLISH from Zemedelsko Zname (Bulgaria), 28 Nov. 1973 p 3 (For availability see N74-16646 07-34)

The areas of practical application for nuclear physics in Bulgaria are reviewed. Emphasis is placed on the resulting scientific-technical achievments in productivity. The solutions to problems related to radiation protection are discussed, and the development of various safeguards is cited. D.L.G.

N74-16649 Joint Publications Research Service, Arlington, Va.
PRINCIPLES FOR LONG-TERM DEVELOPMENT OF ACADEMY'S RESEARCH NETWORK
In its Transl. into Eastern Europe: Sci. Affairs, no. 377 (JPRS-60949) 9 Jan. 1974 p 6-18 refs Transl. into ENGLISH from Magyar Tudomany (Hungary), no. 9, Sep. 1973 p 557-566 (For availability see N74-16646 07-34)

The research network of the Hungarian Academy of Sciences was reviewed and the principles for long-term development were established. These developmental concepts are given and include the following: (1) principal directions of development in the natural sciences, (2) principal directions of development in the social sciences, (3) developmental trends that influence the research network's structure and the research stations' organization, and (4) allocations for development. D.L.G.

N74-16650 Joint Publications Research Service, Arlington, Va.
RESULTS, TASKS OF COMPUTER MEMORY RESEARCH HIGHLIGHTED **c08**
Gyorgy Pataki *In its* Transl. on Eastern Europe: Sci. Affairs, No. 377 (JPRS-60949) 9 Jan. 1974 p 19-23 Transl. into ENGLISH from Magyar Tudomany (Hungary), no. 9, Sep. 1973 p 613-616 (For availability see N74-16646 07-34)

The highlights are presented of lectures given at a scientific conference on computer memory research. The conferees included scientific collaborators of the Hungarian Academy of Sciences research institutes and the industrial research institutes, and the experts of various fields. D.L.G.

N74-16651# Denver Univ., Colo. Petroleum Economics Inst.
BALANCING SUPPLY AND DEMAND FOR ENERGY IN THE UNITED STATES
1972 166 p refs
Avail: NTIS HC $10.50

The proceedings of a conference on the problem of balancing supply and demand for energy in the United States are presented. The time span considered is from 1972 to 1985. The subjects discussed are: (1) U.S. energy demands based on population and economic growth, (2) government policies, national objectives, and the energy industries, (3) long run cost trends for energy sources, and (4) supply and demand aspects of oil, natural gas, coal, electricity, nuclear fuels, and other energy forms. One paper is directed toward the environmental protection and long run supply of crude oil in the United States. For individual titles, see N74-16652 through N74-16661.

N74-16652 Gonzalez (Richard J.), Houston, Tex.
FUTURE UNITED STATES POPULATION, ECONOMIC GROWTH, AND ENERGY DEMANDS
Richard J. Gonzalez *In* Denver Univ. Balancing Supply and Demand for Energy in the US 1972 p 1-8 (For availability see N74-16651 07-34)

The impact of United States population and economic growth on energy demands is discussed. The need for reasonably rational analyses based on correct information and on realistic assumptions with respect to the future energy requirements is stressed. The subjects considered are: (1) the outlook for U.S. population, (2) the potential for U.S economic growth, (3) probable U.S. energy requirements, and (4) perspective on long term energy problems. The author concludes that the future welfare of mankind requires that energy problems receive the best possible rational study as the basis for intelligent decisions about all policies and actions that affect energy availability, cost, and use. Author

N74-16653 Stanford Research Inst., Menlo Park, Calif. Energy and Resources Economics.

GOVERNMENT, POLICIES, NATIONAL OBJECTIVES, AND THE ENERGY INDUSTRIES

Sherman H. Clark *In* Denver Univ. Balancing Supply and Demand for Energy in the US 1972 p 9-27 refs (For availability see N74-16651 07-34)

The requirements for the development of a national policy on energy sources and utilization are discussed. The economic factors which influence the availability of natural gas and petroleum are analyzed. The impact of energy availability on the national goals of economic growth and employment is examined. The most immediate issues to be resolved are identified as oil and gas pricing and the security of the supply of these resources. Tables of data are included to show: (1) free world oil production from 1970 to 1990, (2) energy demands and oil imports from oil producing and exporting countries, (3) the importance of offshore oil imports, and (4) U.S. energy consumption patterns for 1968. Author

N74-16654 First National City Bank, New York.

CAPITAL REQUIREMENTS OF THE ENERGY INDUSTRIES

Edward Symonds *In* Denver Univ. Balancing Supply and Demand for Energy in the US 1972 p 29-37 (For availability see N74-16651 07-34)

The economic factors which influence the investments which should be made in developing natural resources for energy purposes are discussed. Capital outlays for the energy industries of the U.S. involving electricity, oil, gas and other are tabulated for 1970 and estimated for 1980. A similar tabulation is presented for nations of the non-Communist world. Energy demands for the U.S. and non-Communist countries from 1960 to 1980 are analyzed. Factors, other than economic which influence the amounts and types of energy available are examined. Author

N74-16655 Massachusetts Inst. of Tech., Cambridge. Dept. of Economics.

LONG RUN COST TRENDS: PERSIAN GULF AND UNITED STATES

M. A. Adelman *In* Denver Univ. Balancing Supply and Demand for Energy in the US 1972 p 39-72 refs (For availability see N74-16651 07-34)

The production costs of crude oil and natural gas in the U.S. are compared with those for the Persian Gulf nations. A theory of petroleum production costs is presented to show the relationship between production, development, and exploration of petroleum supplies. The effect of changing sources of reserves on the development costs of new petroleum resources is analyzed. The expected supply from the North Shore Alaska petroleum field is reported. Tables of data are included to show the following: (1) development investment in Persian Gulf petroleum, (2) cost projection of Persian Gulf resources from 1965 to 1969, (3) exploration activity and expenditures in North American petroleum development from 1955 to 1970, and (4) significant discoveries of oil and gas from 1945 to 1964. Author

N74-16656 Texas Univ., Austin. College of Social and Behavioral Sciences.

BALANCING THE DEMAND AND SUPPLY OF OIL

James W. McKie *In* Denver Univ. Balancing Supply and Demand for Energy in the US 1972 p 73-90 refs (For availability see N74-16651 07-34)

The economic factors which influence the supply and demand of crude oil in the U.S. are discussed. Estimates are made of the projected availability of petroleum from domestic sources through the year 1980. The availability of petroleum supplies based on the predictions of exploration and development is analyzed. Tables of data are provided to show the following: (1) projections of the oil supply-demand balance from 1980 to 1985, and (2) estimates of domestic U.S. production in 1975, 1980, and 1985. The need for a Federal energy policy is stressed and approaches to such a policy are submitted. Author

N74-16657 North Carolina State Univ., Raleigh.

BALANCING THE SUPPLY AND DEMAND FOR NATURAL GAS

Edward W. Erickson and Robert M. Spann *In* Denver Univ. Balancing Supply and Demand for Energy in the US 1972 p 91-106 refs (For availability see N74-16651 07-34)

An analysis of the supply and demand factors involving natural gas as an energy source was conducted. The need for a workable policy for natural gas production and use is stressed. Factors which have contributed to the lessening supply are reported. Measures for improving the situation are proposed. Tables of data are included to show: (1) predicted and actual discoveries of crude oil and natural gas from 1953 to 1967, (2) trends in well head price of natural gas compared with quantity of natural gas discoveries, (3) effects of oil and gas prices and other variables on oil and gas discoveries, and (4) projections of non-associated natural gas prices and required discoveries for the period of 1972 to 1985. Author

N74-16658 Peabody Coal Co., St. Louis, Mo.

BALANCING THE DEMAND AND SUPPLY OF COAL

Thomas M. Lydon *In* Denver Univ. Balancing Supply and Demand for Energy in the US 1972 p 107-114 (For availability see N74-16651 07-34)

An analysis of coal supplies for energy applications was conducted to determine methods of obtaining a balance between supply and demand. The problems faced by the coal producer and those of the coal user are examined to show the environmental impacts. Methods for meeting the energy shortages through improved coal utilization are proposed. A table is included to show the total demand for U.S. coal (including exports). Author

N74-16659 Kerr-McGee Corp., Oklahoma City.

BALANCING THE DEMAND AND SUPPLY OF ELECTRICITY AND NUCLEAR FUELS

Dean A. McGee *In* Denver Univ. Balancing Supply and Demand for Energy in the US 1972 p 115-130 refs (For availability see N74-16651 07-34)

The problem of obtaining a balance between demand and supply of nuclear fuel for electric power generation in the United States to 1985 is discussed. It is stated that the balance will depend on economic rather than geologic considerations. Proven reserves of uranium and the quality of the resource base that offers potential for new discoveries assure that uranium ore deposits available for development and production will be sufficient to meet demand. Projections are made in the growth of the nuclear powered electric energy field. The operation of the nuclear reactors and the nuclear fuel cycle involved in electric power production are described. Charts are included to show the projected utilization of nuclear fuels and the mix of coal, hydro, gas, thermal, and nuclear fuels to the year 2000. Author

N74-16660 Sun Oil Co., Philadelphia, Pa. Economics and Industry Affairs.

BALANCING THE DEMAND AND SUPPLY OF OTHER ENERGY FORMS

James S. Cross *In* Denver Univ. Balancing Supply and Demand for Energy in the US 1972 p 131-143 (For availability see N74-16651 07-34)

Methods for balancing the demand and supply of various energy forms are discussed. A graphic presentation of the U.S. energy balance for the five year periods beginning in 1970 and extending to 1985 is developed. The economic and environmental factors involved in using hydroelectric, geothermal, synthetic gas, and tar sands for energy sources are examined. Other sources of energy from agricultural products and tidal energy are analyzed. The potential for using more of the energy available from the sun is proposed. Author

N74-16661 Texas Univ., Austin.

ENVIRONMENTAL PROTECTION AND LONG RUN SUPPLY OF CRUDE OIL IN THE UNITED STATES

Stephen L. McDonald *In* Denver Univ. Balancing Supply and Demand for Energy in the US 1972 p 145-158 refs (For availability see N74-16651 07-34)

A study was conducted to determine the effects of energy conversion on the environment. The effects of various types of energy sources were examined and examples of legislation to reduce environmental pollution are presented. The subjects discussed are: (1) protection of the environment and national income, (2) allocation of environmental protection costs, (3) environmental protection problems in the petroleum industry, and

(4) progress in developing new environmental protection techniques. Author

N74-16662# Committee on Interior and Insular Affairs (U. S. Senate).
ENERGY EMERGENCY LEGISLATION, PART 1
Washington GPO 1973 364 p refs Hearing on S. 2589 before Comm. on Interior and Insular Affairs, 93d Congr., 1st Sess., 8 Nov. 1973
Avail: SOD HC $2.35

A Congressional hearing concerning emergency energy legislation was conducted. The purpose of the legislation was as follows: (1) to declare by congressional action a nationwide energy emergency, (2) to authorize the president to immediately undertake specific actions to conserve scarce fuels and increase supply, (3) to initiate the development of local, state, national, and international contingency plans, and (4) to assure the continuation of vital public services. P.N.F.

N74-16663# Committee on Interior and Insular Affairs (U. S. Senate).
BLACKSBURG, VIRGINIA, RESEARCH CENTER
Washington GPO 1973 45 p Hearing on S. 378 Before Comm. on Interior and Insular Affairs, 93d Congr., 1st Sess., 25 Sep. 1973
Avail: Subcomm. on Minerals, Mater. and Fuels

A hearing was conducted before the Congressional Subcommittee on Minerals, Materials, and Fuels concerning the establishment and operation of a research center at Virginia Polytechnic Institute and State University at Blacksburg, Virginia. The purpose of the hearing was to enact legislation to provide a location for a research center now located at the University of Maryland. The lease for the U. of Md. center expires in June 1978 and replacement research facilities will be required. P.N.F.

N74-16664# Committee on Interior and Insular Affairs (U. S. Senate).
FUEL SHORTAGES, PART 1
Washington GPO 1973 530 p refs Hearings before Comm. on Interior and Insular Affairs, 93d Congr., 1st Sess., 1 Feb. 1973 2 Vol.
Avail: Comm. on Interior and Insular Affairs

A Congressional hearing was conducted to investigate the factors contributing to current shortages of natural gas, residual oil, and other refined products. Testimony from the Senators of various states is submitted to show the extent of the energy crisis and their understanding of the basic causes. Communications from various segments of the economy are included to define the scope of the shortages and the impact on industry, public utilities, and home use. Tables of data are developed to show the resources available and the anticipated problem areas. The actions to be taken by Federal organizations to improve the energy situation are recommended. P.N.F.

N74-16665# Committee on Interior and Insular Affairs (U. S. Senate).
FUEL SHORTAGES, PART 2
Washington GPO 1973 270 p refs Hearings before Comm. on Interior and Insular Affairs, 93d Congr., 1st Sess., 22 Feb. 1973 2 Vol.
Avail: Comm. on Interior and Insular Affairs, 93d Congr., 1st. Sess., 22 Feb. 1973
For Abstract See N74-16664

N74-16666# Committee on Interior and Insular Affairs (U. S. Senate).
THE EVOLUTION AND DYNAMICS OF NATIONAL GOALS IN THE UNITED STATES
Franklin P. Huddle Washington GPO 1971 66 p refs Presented to Comm. on Interior and Insular Affairs, 92d Congr., 1st Sess., 16 Aug. 1971 Prepared by Library of Congr.
Avail: Comm. on Interior and Insular Affairs

A Congressional hearing was conducted to examine the evolution and dynamics of the National Goals in the U.S. The study reviews the history of national goal formation beginning with the Preamble to the Constitution of the United States. The process and specifics of national goal formation during several administrations are described. The background information provided by the study is considered useful in identifying the role of the energy policy in the implementation of national goals. The subjects contained in the study are: (1) historical evolution of the goals of the U.S., (2) maturation of early constitutional goals, (3) succession of national goals in the past half-century, (4) the interaction of science and technology with national goals, and (5) recent attempts to chart new goals for America. P.N.F.

N74-16667# Committee on Interior and Insular Affairs (U. S. Senate).
A REVIEW OF ENERGY ISSUES AND THE 91ST CONGRESS
Washington GPO 29 Jan. 1971 41 p refs Presented to Comm. on Interior and Insular Affairs, 92d Congr., 1st Sess, 15 Dec. 1970 Prepared by Library of Congr.
Avail: Comm. on Interior and Insular Affairs

A review of the energy crisis issues considered by the U.S. Congress was conducted. The purpose of the review is to examine the interrelationships between energy supply, the environment, resource conservation, economic growth, and the attainment of important national goals. The policy issues in the energy field involve the following: (1) oil imports, (2) trans-Alaska pipeline, (3) outer continental shelf, (4) natural gas supply, (5) shortages and movement toward an overall energy policy, (6) electric power generation and transmission, and (7) nuclear energy development and environmental effects. P.N.F.

N74-16668# Committee on Interior and Insular Affairs (U. S. Senate).
COMPACT TO CONSERVE OIL AND GAS
Washington GPO 1971 30 p Hearing on S. J. Res. 72 before Comm. on Interior and Insular Affairs, 93d Congr., 1st Sess., 17 Jun. 1971
Avail: Subcomm. on Minerals, and Fuels

A Congressional hearing concerning an extension of the Interstate Compact to Conserve Oil and Gas was conducted. The purpose of the compact is to prevent physical waste of natural resources within the states which ratify the compact. The states are expected to accomplish the legislation to prevent the following: (1) operation of any oil well with an inefficient gas-oil ratio, (2) drowning with water of any stratum capable of producing oil or gas, or both oil and gas, in paying quantities, (3) avoidable escape into the open air or the wasteful burning of gas from a natural gas well, (4) the creation of unnecessary fire hazards, (5) the drilling, equipping, locating, spacing, or operating a well or wells so as to bring about physical waste of oil or gas, and (6) the inefficient, excessive, or improper use of reservoir energy in producing wells. Author

N74-16669# Committee on Interior and Insular Affairs (U. S. Senate).
FEDERAL ENERGY ORGANIZATION: A STAFF ANALYSIS
Washington GPO 1973 66 p refs Presented to Comm. on Interior and Insular Affairs, 93d Congr., 1st Sess., 5 Mar. 1973
Avail: Comm. on Interior and Insular Affairs

A Congressional staff analysis was prepared to provide information on the significance of energy organization and the present organization structure for handling energy matters. A history of the Federal Energy Organization is provided and the functions in various areas of resources management are defined. The deficiencies in existing Federal Energy Organizations are analyzed. A tabulation of the Federal Energy Agencies is provided. Summaries of proposed Federal reorganization for energy are developed. P.N.F.

N74-16670# Committee on Interior and Insular Affairs (U. S. Senate).
GEOTHERMAL ENERGY RESOURCES AND RESEARCH
Washington GPO 1972 472 p refs Hearings before Comm. on Interior and Insular Affairs, 92d Congr., 2d Sess., 15 and 22 Jun. 1972
Avail: SOD HC $2.75

A Congressional hearing was conducted to discuss the role of geothermal energy resources in the nation's economy. The proposed costs of research and development projects for geothermal energy exploitation are discussed. The research projects to be conducted are defined. Information is provided on the subjects of: (1) assessment of geothermal energy resources,

(2) a theoretical study of geothermal energy extraction, (3) classification of public lands valuable geothermal steam and associated geothermal resources, and (4) environmental impact statement for the geothermal leasing program. P.N.F.

N74-16671*# Washington Univ., St. Louis, Mo. Center for Development Technology.
EDUCATION OF THE HANDICAPPED CHILD: STATUS, TREND, AND ISSUES RELATED TO ELECTRONIC DELIVERY
Donna Rothenberg Dec. 1973 93 p refs
(Grant NGR-26-008-054)
(NASA-CR-136628; Memo-73/4) Avail: NTIS HC $6.75 CSCL 05I

This study is part of a broader investigation of the role of large-scale educational telecommunications systems. Thus, data are analyzed and trends and issues discussed to provide information useful to the systems designer who wishes to identify and assess the opportunities for large-scale electronic delivery of education for the handicapped. Author

N74-16672*# National Aeronautics and Space Administration, Washington, D.C.
THE 1973 NASA PAYLOAD MODEL: SPACE OPPORTUNITIES 1973 - 1991
Oct. 1973 73 p
(NASA-TM-X-69421) Avail: NTIS HC $5.75 CSCL 05A

The tables of schedules and descriptions which portray the 1973 NASA Payload Model are presented. The schedules cover all NASA programs and the anticipated requirements of the user community, not including the Department of Defense, for the 1973 to 1991 period. The descriptions give an indication of what the payload is expected to accomplish, its characteristics, and where it is going. The payload flight schedules shown for each of the discipline areas indicate the time frame in which individual payloads will be launched, serviced, or retrieved. These do not necessarily constitute shuttle flights, however, since more than one payload can be flown on a single shuttle flight depending on size, weight, orbital destination, and the suitability of combining them. The weight, dimension, and destination data represent approximations of the payload characteristics as estimated by the Program Offices. Payload codes are provided for easy correlation between the schedules and descriptions of the Payload Model and subsequent documentation which may reference this model. Author

N74-16673# RAND Corp., Santa Monica, Calif.
A METHODOLOGY FOR PROJECTING THE ELECTRICAL ENERGY DEMAND OF THE MANUFACTURING SECTOR IN CALIFORNIA
W. E. Mooz and C. C. Mow Jan. 1973 75 p refs
(Grant NSF GI-44)
(R-991-NSF/CSRA) Avail: NTIS HC $5.75

The methodology reported is one part of a total electrical energy demand estimating methodology developed for use in California. Separate methodologies were developed for each sector of the economy, which comprises the following: residential; industrial (consisting of manufacturing and mining); commercial; governmental; and agricultural. In place of quantitative, determinant-based relationships, the methodology described relies on the projection of individual trends in electrical energy use for each of 20 manufacturing industries identified by the Standard Industrial Code. Data on these trends are presented, and reasonable projections are suggested. In addition, the roles of each of the determinants of electrical energy use are explored qualitatively for the benefit of analysts required to apply judgment in selecting inputs for the methodology. Author

N74-16674# RAND Corp., Santa Monica, Calif.
FUEL FROM ORGANIC MATTER: POSSIBILITIES FOR THE STATE OF CALIFORNIA
Doris J. Dugas Oct. 1973 19 p refs
(P-5107) Avail: NTIS HC $3.00

The amounts of organic material that might be made available for energy purposes in the State of California, its potential fuel value, and the estimated cost are investigated. Sources of organic material that are considered are: (1) crops grown specifically for energy, (2) natural forests, and (3) wastes from the urban, agricultural, and industrial sectors. Preliminary results indicate that about 19 percent of California's gas supply could be derived from organic sources. Author

N74-16675# RAND Corp., Santa Monica, Calif.
THE SOVIET UNION, THE MIDDLE EAST, AND THE EVOLVING WORLD ENERGY SITUATION
Arnold L. Horelick Oct. 1973 10 p ref Presented at Conf. on Choices for Europe and Am. The Middle East and the Energy Situation, 1973-1985, Ditchley Park, Engl.; sponsored by Ditchley Found., Intern. Inst. for Strategic Studies, Middle East Inst., and the World Peace Found.
(P-5109) Avail: NTIS HC $3.00

The U.S.S.R.'s position on the world oil crisis is discussed with special attention given to the limits of Soviet influence in global politics and a Soviet-preferred future world energy scenario. K.M.M.

N74-16676# RAND Corp., Santa Monica, Calif.
MEASURES FOR SLOWING GROWTH IN ELECTRICITY CONSUMPTION
Ronald D. Doctor Apr. 1973 16 p refs Presented at Hearing of Subcomm. on State Elec. Energy Policy of Calif. State Assembly Comm. on Planning and Land Use, Sacramento, 23 Feb. 1973 Sponsored by NSF
(P-5017) Avail: NTIS HC $3.00

Methods for reducing the growth rate of electricity demand are examined. The greatest opportunities for slowing growth were found in the residential and commercial sectors. Measures for conserving energy are presented, such as improved insulation, solar energy, gas substitution, increased air conditioning efficiency, decreased electricity for lighting, and low energy buildings. J.A.M.

N74-16677# RAND Corp., Santa Monica, Calif.
ENERGY CONSERVATION IN PUBLIC AND COMMERICAL BUILDINGS
Richard G. Salter and Deane N. Morris Oct. 1973 61 p Sponsored by NSF
(P-5093) Avail: NTIS HC $5.25

A discussion is presented of the preliminary results of an ongoing study of the use of energy in public and commercial buildings. The effects of building location, design and operation alternatives are developed, together with initial estimates of the conservation potential in the sector. Author

N74-16678# Technische Univ., Berlin (West Germany).
FOUNDATIONS FOR PLANNING OF RESEARCH AND DEVELOPMENT PROCESSES WITH STOCHASTIC NETS Ph.D. Thesis [ANSAETZE ZUR PLANUNG VON FORSCHUNGS- UND ENTWICKLUNGSPROZESSEN MIT STOCHASTISCHEN NETZWERKEN]
Volker Kerssenfischer 1972 178 p refs In GERMAN
Avail: NTIS HC $11.00

Planning and implementation of a research and development process by stochastic nets requires the definition of basic processes in the overall technological process and systematic formalization and quantization of optimal decision strategies. Stochastic nets for a sequential, parallel, and mixed sequential-parallel development processes that use their own components are developed. Systems optimization reduces stochastic nets by estimates for probability of duration and cost of development activities. Time dependence in the optimization for a developing system is demonstrated by comparing a parallel and a sequential research and development process. Transl. by G.G.

N74-16679# RAND Corp., Santa Monica, Calif.
A METHODOLOGY FOR PROJECTING THE ELECTRICAL ENERGY DEMAND OF THE COMMERCIAL SECTOR IN CALIFORNIA
W. E. Mooz and C. C. Mow Mar. 1973 46 p refs
(Grant NSF GI-44)
(R-1106-NSF/CSRA) Avail: NTIS HC $4.50

Methodology was developed for the electrical energy demand of commercial sectors, mining portion of the industrial sector, and other small sectors of California economy. Methodologies were based upon the output of the sector, measured in terms of dollars of value added or dollars of contributed to gross state

product; on the electrical energy intensiveness of the sector; and upon the price of electricity and natural gas. In small sectors, such as agriculture and railroads, the use of electricity was found to be either constant or the result of fairly simple forces. J.A.M.

N74-16680# RAND Corp., Santa Monica, Calif.
CALIFORNIA'S ELECTRICITY QUANDARY. 3: SLOWING THE GROWTH RATE
R. D. Doctor, K. P. Anderson, M. B. Berman, S. H. Dole, M. J. Hammer, P. T. McClure, and C. B. Smith Sep. 1972 158 p refs
(Grant NSF GI-44)
(R-1116-NSF/CSA) Avail: NTIS HC $10.00

Results are presented of one part of a broad study effort on the underlying cause of the conflict between energy and the environment-the rapid increase in demand for energy in all its forms-and on the implications of this conflict for governmental policymaking. The objectives are: (1) to examine the need for new state policies that would slow the growth of electricity demand: (2) to estimate the potential effectiveness of policies designed to slow the growth rate; and (3) to evaluate the potentially important side effects of slowed electricity growth.
Author

N74-16681# RAND Corp., Santa Monica, Calif.
THE ROLES OF GOVERNMENT IN TRANSPORTATION PLANNING
Laurel V. Roennau Aug. 1973 26 p
(P-5079) Avail: NTIS HC $3.50

Some of the less conventional concerns of the transportation planner are defined and structured, with special emphasis on the function of government. Topics include: the levels of government; conflicting objectives of transportation planning; strategy choices for national planning guidance; R and D investment strategies; and institutional constraints and problems. A matrix of decision-influencing factors is given as a guidline to identifying areas of concern and responsibility. K.M.M.

N74-16682# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS OF SOUTH AND EAST ASIA, NO. 450
22 Jan. 1974 27 p Transl. into ENGLISH from various South and East Asian periodicals
(JPRS-61035) Avail: NTIS HC $3.50

The status and level of Japanese efforts in the field of scientific research and development planning are considered. Specific methods are discussed for decision making in systems of organizational management. Methods and procedures in planning scientific research and development at the national level and in large corporations are reviewed.
Author

N74-16683*# Kanner (Leo) Associates, Redwood City, Calif.
SPACE RESEARCH: EFFECT ON SCIENCE AND TECHNOLOGY
Washington NASA Feb. 1974 23 p Transl. into ENGLISH from Khim. i Zhizn (USSR), no. 12, Dec. 1973 p 8-18
(Contract NASw-2481)
(NASA-TT-F-15330) Avail: NTIS HC $3.25 CSCL 22A

The 24th Congress of the International Astronautics Federation was held, and discussed various problems, including the selection of norms for space law, the influence of space activities in the environment, and the safety of experiments with rocket models conducted by young people. This article includes basically nontechnical reports filed by reporters covering the Congress.
Author

N74-16684# Committee on Science and Astronautics (U. S. House).
GEOTHERMAL ENERGY
Washington GPO 1973 390 p refs Hearings on HR. 8628 and H.R. 9658 before Comm. on Sci. and Astronaut., 93d Congr., 1st Sess., No. 21, 11, 13, and 18 Sep. 1973
Avail: Subcomm. on Energy

The hearings are reported concerning the economic and technological feasibility of developing geothermal energy sources. Two bills are presented and discussed which would establish a Geothermal Energy Development Corporation to construct two or more geothermal demonstration installations and to develop alternate technology for generating steam and electric power from geothermal sources. Other topics include: the state of geothermal energy technology; environmental problems; the status of R and D activities; and international and foreign policy considerations.
K.M.M.

N74-16685# Yale Univ., New Haven, Conn. Cowles Foundation for Research in Economics.
SOME OBSERVATIONS ON OPTIMAL ECONOMIC GROWTH AND EXHAUSTIBLE RESOURCES
Tjalling C. Koopmans 1973 18 p refs Sponsored by NSF and Ford Found.
(Cowles-Foundation-Paper-396) Avail: NTIS HC $3.00

The optimal paths of trading for an exhaustible resource model are compared in terms of consumption. The optimal rate of utilization of exhaustible resources, and the theory of optimum capital growth are discussed. It is concluded that the combination of discounting of future utilities at a positive rate, and the costless storage in nature of the resource prior to extraction leads to an exponential increase in the scarcity price of the resource. F.O.S.

N74-16686# Admiralty Surface Weapons Establishment, Portsmouth (England).
PERT: AN ALGOL 60 COMPUTER PROGRAM
M. H. A. Smith Feb. 1973 76 p refs
(TR-73-5; BR37352) Avail: NTIS HC $6.00

An ALGOL 60 computer program (for a Marconi-Elliott 900 series computer with paper tape input and output) is presented and described in sufficient detail for someone not experienced in either PERT or computer programming to understand how to make use of it. The program is in current use to analyze network diagrams and to produce the several types of relevant reports required. Particular attention is paid to the practical updating of the network, and to the use of the reports as a valuable medium for communication among members of a project team. An example of its application to the production planning of a hypothetical radar type is detailed.
Author (ESRO)

N74-16687# European Space Research Organization, Paris (France).
STATISTICAL-ANALYTICAL COST MODELS FOR DESIGN, DEVELOPMENT AND MANUFACTURE OF SPACECRAFT
D. E. Koelle (Messerschmitt, Boelkow, Blohm, Ottobrunn, West Ger.) Dec. 1973 103 p refs Transl. into ENGLISH from Raumfahrtforsch. (Stuttgart), v. 6, no. 1, 1972 p 1-14
(ESRO-TT-4) Avail: NTIS HC $7.25

Improved cost formulas are derived for different types of space projects such as research satellites, application satellites, interplanetary spacecraft, launch vehicle stages, rocket engines, and manned space vehicles. The statistically-derived cost formulas for the fabrication and development of space projects, provide the basis for the analytical cost models. By the introduction of a learning factor dependent on mass and production rate, and technical complexity factors, the formulas enable initial cost estimates of space projects to be calculated more accurately.
Author (ESRO)

N74-16688# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE AEROSPACE CORPORATION: PAST, PRESENT, AND FUTURE M.S. Thesis
James Franklin Wheeler Sep. 1973 122 p refs
(AD-768386; GSM/SM/73-26) Avail: NTIS CSCL 05/1

The Aerospace Corporation was created in 1960 to provide General Systems Engineering and Technical Direction services to the U.S. Air Force and its contractors in support of national space and missile programs. As the priorities associated with these programs have changed in the intervening thirteen years, the role of Aerospace has changed considerably. Today, Aerospace is pursuing an active diversification program and has gained de facto independence of its founder and primary sponsor, the U.S. Air Force. The contemporary situation needs close examination by a competent agency to determine if the management concept embodied in Aerospace is still the best way to obtain these services and if national security interests are being served adequately.
Author (GRA)

N74-16689# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE NATURAL MEDIUM AND SPACE
Kirill Yakovlevich Kondratev 10 Oct. 1973 20 p ref Transl. into ENGLISH Kirill Yakovlevich (USSR), no. 5, 1972 p 169-183
(FTD Proj. T74-01-42)
(AD-768459; FTD-MT-24-704-73) Avail: NTIS CSCL 08/6
The article reviews use of scientific satellites on the remote sensing of earth events from space. GRA

N74-16690# Massachusetts Inst. of Tech., Cambridge. Energy Lab.
MODELING OF ELECTRIC POWER DEMAND GROWTH Final Report
J. B. Woodard, Jr., M. L. Baughman, and F. C. Schweppe Feb. 1973 20 p refs Presented at MIT Conf. on Energy: Demand, Conservation and Institutional Probl., 12-15 Feb. 1973
(Grant NSF GI-32874)
(PB-224045/5GA; MIT-EL-73-015) Avail: NTIS HC $3.00 CSCL 10B
The paper describes a modeling approach, presently under development, directed at the growth in demand for electric power. The emphasis is to develop a mathematical model which can be used for the analysis of detailed questions, such as: How will changes in air conditioning power demand, electric rate structures, population, etc., affect the daily load shapes (MW vs time) as well as the peak power and the overall electric energy consumption. Detailed answers to these questions are needed for generation planning of capacity and plant mix (nuclear, fossil, and pumped-hydro) as well as for the evaluation of the resulting environmental and economic impacts. These issues require detailed models combining economic models with engineering considerations affecting the dynamics of load behavior. Modeling of this kind can be limited by the data available, and an important aspect of this effort is to identify the data required for a detailed understanding of the load. The approach to be employed is a combination of state dynamic models driven by stochastic processes with economic models. GRA

N74-16691# Army War Coll., Carlisle Barracks, Pa.
UNITED STATES PETROLEUM SITUATION THROUGH 1980
Robert W. Huebner 14 Mar. 1973 54 p refs
(AD-761576) Avail: NTIS CSCL 10/2
The current and projected United States petroleum and natural gas requirements through 1980 are examined. These two resources account for three-fourths of all the energy consumed in the United States. The unprecedented rate at which they are being consumed has caused an imbalance between demand and supply and presents the Nation with an energy problem of serious and growing proportions. Domestic production is now unable to supply the needs of some consumer sectors and shortages of certain fuels exist. During the next three to five years, a further deterioration of the domestic supply position is anticipated and a sharp increase in imports is projected. The long lead times required to provide new domestic supplies make this development virtually certain. The United States also faces a serious balance of trade deficit as a result of our growing need for imports. In short, our petroleum position will become more severe in the longer term if present trends and policies continue.
Author (GRA)

N74-16692# California State Office of Planning and Research, Sacramento.
THE STATE OF CALIFORNIA, SUMMARY: ENVIRONMENTAL GOALS AND POLICY Final Report
John S. Tooker 1 Jun. 1973 50 p
(PB-223940/8GA; QPR-03) Avail: NTIS HC $4.50 CSCL 13B
The report is a statement of the state's environmental goals and policies as adopted by the Governor and is presented as a suggested guide for state government, all levels of local government, and the private sector. It contains general policies on air, land use, noise, pesticides, population, solid waste, transportation, and water. It also identifies the significant areas and potential areas of critical concern to the state for the following environmental resources: scientific, scenic and educational; wildlife habitats; forest and agriculture; open space surrounding metropolitan areas; beaches, lakes and riverbank access; connecting links for recreation, historic, archaeological and cultural resources; lands of hazardous concern; and environmental resource policies. Eleven fundamental principles to guide land use and environmental legislation are included. GRA

N74-16693# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AN ANALYSIS OF THE ACQUISITION OF THE F-111A SIMULATORS M.S. Thesis
Billie Jatzen and Gerald J. Schulke Aug. 1973 62 p refs
(AD-769202; SLSR-33-73B) Avail: NTIS CSCL 15/5
The Department of Defense (DOD) is concerned about the effectiveness of acquisitions with midrange dollar values. In order to ascertain the effectiveness of a specific mid-range dollar value acquisition, the F-111 simulator acquisition was studied and analyzed. The report ascertains the effectiveness of the procurement of the F-111A simulator and comments on the strengths and weaknesses of the acquisition. GRA

N74-16694# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
A COMPARATIVE ECONOMIC ANALYSIS OF A LIGHTER-THAN-AIR LOGISTICS SYSTEM M.S. Thesis
Roy D. Hammesfahr and Thomas R. Hawk Aug. 1973 60 p refs
(AD-769205; SLSR-39-73B) Avail: NTIS CSCL 15/5
Lighter-Than-Air (LTA) vehicles have been used since the 18th century for a variety of purposes, including research, surveillance, and personnel and material transportation. Successful, safe operation of airships is thought to be within the range of modern technology. A comparative economic analysis of available surface and air transportation systems is conducted to identify the least expensive system. In addition, an LTA system is proposed with its estimated cost factors and these costs are compared with the costs of the present day systems to see if the airship could meet logistics requirements and do so at a favorably competitive cost. GRA

N74-16695# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN ANALYSIS OF THE PHASED INSPECTION SYSTEM FOR B-52H AIRCRAFT M.S. Thesis
Barry L. Barnes Mar. 1973 113 p refs
(AD-769154; GSA/SM/73-2) Avail: NTIS CSCL 15/5
Analysis of a phased aircraft inspection system indicated a wide interval variability between inspections for various aircraft, when the interval was measured in flying hours, calendar days, or sorties between phases. Certain performance measures were identified, such as code 2 and code 3 system malfunctions, late take-offs, mission cancellations, inspect and repair manhours, and aircraft nonavailability. Based on the analysis, costs of phased inspections could apparently be reduced, without a loss of reliability, by increasing the number of flying hours between inspections. (Modified author abstract) GRA

N74-16696# Stanford Research Inst., Menlo Park, Calif.
INTRUSION DETECTION DEVICES AND SYSTEMS FOR AIR BASE SECURITY Final Report, Jul. 1972 - Mar. 1973
T. Kovattana and A. Rosengreen Griffiss AFB, N. Y. RADC Aug. 1973 127 p refs
(Contract F30602-72-C-0531; AF Proj. 692B)
(AD-769081; RADC-TR-73-246) Avail: NTIS CSCL 15/3
Feasibility studies of polymer films and nematic liquid crystals were conducted to assess their application in future military intrusion-detection sensors and sensor systems. Several polymer films were fabricated into pyroelectric infrared detectors, and their major characteristics were measured. MBBA nematic liquid crystals were fabricated into pressure detectors and their pertinent capabilities were assessed and compared with available detectors. In addition, a general theory of the operation of Combined Sensor detectors was developed to provide methods that can be used in the design and development of intrusion-detection systems using two complementary sensors. Author (GRA)

N74-16697# Army War Coll., Carlisle Barracks, Pa.
THE US ENERGY CRISIS, THE MULTINATIONAL OIL

CORPORATIONS AND THEIR RELATIONSHIP TO U.S. FOREIGN POLICY IN THE MIDDLE EAST

John G. Pappageorge 28 Feb. 1973 59 p refs
(AD-760868) Avail: NTIS CSCL 05/3

America's current energy crisis consists of a growing dependence on foreign oil brought about by a continuing diminution in known domestic petroleum reserves and aggravated by a host of domestic anomalies that cry out for some sort of unified energy policy. Yet any steps taken domestically will have far reaching international effects, particularly in the Middle East. Eight giant corporations (five of them American) discover and pump most of the oil out of the ground in the producing countries. Hence, they have a powerful influence in the Middle East and are a contributing factor in the stabil ty of that politically volatile part of the world. Modified author abstract (GRA)

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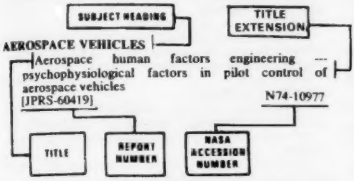
TYPICAL SUBJECT INDEX LISTING



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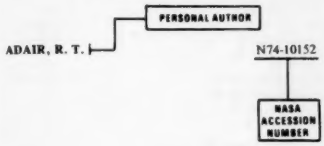

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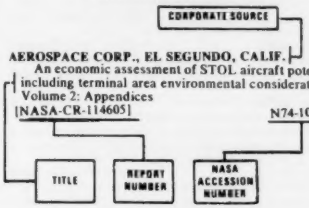

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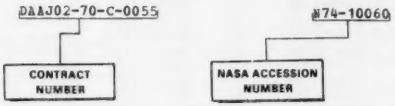

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